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The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

IN THE MATTER OF THE GAS RESOURCES PRESERVATION ACT

AND IN THE MATTER of a Joint Hearing to determine various questions relating to the proposed Export of Natural Gas from the Province of Alberta.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session: October 29th, 1951.

Volume 17.

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VOLUME 17.

29 October 1951.

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VOLUME 17.

29 October 1951.

Mr. McDONALD: Mr. Chairman, the Westcoast Company, sir, is prepared to proceed. I was hopeful that Mr. Brown of the Hudson's Bay Oil and Gas Company would be present this morning to make his presentation. He is not here so with the Board's permission I will proceed and introduce, when it is convenient to Mr. Brown, his evidence. At the time his evidence is introduced I then hope to have Dr. Link introduce the general submission in regard to the geology of the Peace River country which has been prepared by him.

I might point out, sir, that during the course of the last week I forwarded to counsel copies of submissions prepared by Ford, Bacon & Davis with regard to markets for natural gas for the Pacific Northwest, the route, design of pipeline and gathering system costs and United States costs. Now, all of these submissions as sent out are incorporated in one volume which I think will be more convenient both to the Board and the counsel, and this submission which will be introduced in evidence will contain the markets for natural gas in the Pacific Northwest project, pipeline routes, pipeline design, estimated construction costs, summaries of estimated transmission system construction cost divided into three categories, the gathering system in Alberta, the main line system in Canada, and the main line system in the United States, details of estimated direct cost of pipelines and

Dominion.

VANCOUVER, British Columbia
20 October 1951.

Mr. MODSKIE: Mr. Chairman, the Westcoast Company, sir, is prepared to proceed. I was hopeful that Mr. Brown of the Hudson's Bay Oil and Gas Company would be present - bearing in mind to make his presentation, the 12 or 13 days ago with the board's permission I will proceed and introduce, when it is convenient* to Mr. Brown, his evidence. At the close his evidence is introduced I then hope to have Dr. Link introduce the general submission in regard to the geology of the Peace River country which has been prepared by him.

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measuring stations for the three projects, and details of estimated direct cost of compressor stations. This will be put in evidence by Mr. Sample and by Mr. Poor, so that the books I forwarded during the week are now incorporated in one volume.

In addition to that, sir, I have a submission prepared with regard to deliverability of Peace River gas, which has been revised and which will be presented by Dr. Hetherington when he is available. So that I will distribute those two, sir, now.

THE CHAIRMAN: Mr. McDonald, before you proceed, I would like to tell other counsel that the Board is somewhat concerned that we have not received any other submissions at all and we hope that we will get those right away. The agreement was we would get those in at least a week before these proceedings commenced. The only ones we have received are from Mr. McDonald.

MR. S.B. SMITH: For the company I represent, our submissions were prepared some time ago and, sir, mailed some days ago. With the weather they may have been held up. We expect them in any moment.

MR. C.E. SMITH: During the air, I guess the pass was intercepted, Mr. Smith.

MR. NOLAN: I have some material that should arrive today or tomorrow and will be distributed as soon as received.

MR. PORTER: Sir, I have the engineering report which was read at the last Hearing. The market report is not quite complete, the reason being that there was some effort made to bring it up to date by getting as

Discussion.

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MR. FORTNER: Sir, I have the engineering report which was read at the last hearing. The market report is not quite complete, the reason being that there was some effort made to bring it up to date by getting as

much as possible of the 1951 census. I doubt if it will be here before the first of the week, but we have the engineering report meantime.

MR. MACLEOD: I think, sir, our material will be in by the end of the week.

MR. MARTLAND: Ours are in the course of preparation, sir, and will be submitted as speedily as possible.

DR. GOVIER: Mr. McDonald, does this new submission you are distributing contain anything in addition to what was contained in the previous four pamphlets?

MR. McDONALD: Yes, sir. The route is varied and there are some slight revisions in costs.

DR. GOVIER: Thank you.

MR. McDONALD: For instance, the gathering cost is some $400,000.00 greater in cost in this new submission than it was.

DR. GOVIER: And this definitely supersedes the other?

MR. McDONALD: Yes, supersedes the other. I am sorry to do it this way, but I think it is more convenient. I will distribute, sir, the deliverability at the recess.

THE CHAIRMAN: Exhibit 44.

SUBMISSION ON BEHALF OF WESTCOAST TRANSMISSION COMPANY LIMITED BY FORD, BACON & DAVIS INCORPORATED, ENGINEERS, PUT IN AND MARKED EXHIBIT 44.

Discussion.

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COLEMAN R. SAMPLE, having been first duly sworn, examined by Mr. McDonald, testified as follows:

Q Mr. Sample, you have been sworn. Mr. Sample has been qualified before the Board, sir. The portion of this Exhibit 44 which you are to deal with, Mr. Sample, is the matter of markets for natural gas commencing at page 2 to 18 inclusive?

A Right.

Q Now, I think that if you would read your submission and refer to your tables that would be the quickest way of putting it before the Board.

A Westcoast Transmission Company, Limited.

MARKET FOR NATURAL GAS

The proposed pipeline of the Westcoast Transmission Company, Limited, was conceived originally to supply natural gas to the large consuming centers of Vancouver, B.C., Seattle and Tacoma, Wash., and Portland, Ore. Each of these communities is now supplied with manufactured gas.

The route of the proposed pipeline makes it possible to furnish natural gas to several smaller communities, some having manufactured gas distribution systems and some without.

A summary of the market to be reached, showing population, present gas service and estimated sales of natural gas in the fifth year after beginning of operation of the pipeline, follows.

This summary on page 4 shows the principle communities or cities to be served by natural gas, the

C. R. Sample,
Dir. Ex. by Mr. McDonald.

estimated population, the type of manufactured gas available where they now have gas service. In the last column is the estimated sales in the 5th year of natural gas. As pointed out, the pipeline figures for the United States communities as shown in the first column are based on preliminary 1950 census figures. The figures for Canada are estimated populations based on the 1941 census.

Market Area to be Served
Population - Present Gas Service - Estimated Fifth Year Sales

Location	Estimated Population	Type of Manufactured Gas Available	Estimated Sales of Natural Gas Fifth Year (Mcf)
Canada			
Kamloops	6,500	None	142,000
Princeton	1,150	None	1,229,000
Hope	700	None	16,100
Vancouver	471,000(A)	Coal and Water	9,491,000
Unallocated (B)	150,000	None	1,078,700
Total Canada	629,350		11,956,800
United States			
West Coast:			
Bellingham, Wash.	34,000(A)	Propane-Air	2,263,000
Mt. Vernon, "	5,200	None	27,600
Everett, "	34,000(A)	Propane-Air	2,131,200
Bellevue, "	10,000	None	61,000
Seattle, "	481,700(A)	Oil and Water	14,710,000
Tacoma-Olympia"	171,000(A)	Water	7,723,900
Centralia-Chehalis, "	14,300(A)	Butane-Air	231,400
Kelso-Longview "	27,500(A)	Butane-Air	800,200
St.Helens, Ore.,	4,700	None	44,800
Portland, "	600,000(A)	Oil and Cokeoven	23,191,000
Unallocated		None	648,000
Total West Coast	1,382,400		51,832,100
Total	2,011,750		63,788,900

Note: (A) Estimated population of area now served with manufactured gas. For communities in the United States, preliminary 1950 census figures have been used where available.

(B) To provide for communities such as Prince George, Quesnel, Williams Lake, Chilliwack and other Metropolitan Vancouver Areas.

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Dir. Ex. by Mr. McDonald.

The map herein entitled "Market Areas to be Served by the Proposed Natural Gas Pipe Line on West Coast", - that map follows page 17 - shows the market area to be served by the proposed pipeline from the Vancouver, B.C., area south to Portland, Oregon and the principal cities therein.

Population and Character of Territory to be served with Natural Gas.

The total population to be reached by the proposed pipeline system is about 2,000,000 at the present time and is estimated to be more than 2,500,000 within five years after the pipeline is completed.

In general this area represents the most rapidly growing section of both Canada and the United States. It is estimated that the population of British Columbia increased 55.9 per cent in the 17-year period, 1931 to 1948, or at a rate of approximately 2-1/3 times the average for Canada as a whole. Most of this growth has occurred in the Vancouver area. In the Pacific Coast Area of the United States the population and industrial growth has been more rapid in the last 10 years than any other part of the country. Preliminary 1950 census figures show population increases in the last 10 years for the six fastest growing States as follows. Of the six States, California leads with an increase in population in the last decade of 53.3 per cent; and Arizona, a small State, a population increase of 50.1 per cent; Florida, third, with a population increase of 46.1 per cent; Nevada, again a very small State, fourth, with a population increase of 45.2 per cent; and then

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Oregon and Washington in which the per cent increase in population for the decade was 39.6 per cent and 37 per cent respectively.

State	1950 Population	Per cent Increase 1940 to 1950
California	10,586,223	53.3%
Arizona,	749,587	50.1
Florida	2,771,305	46.1
Nevada	160,083	45.2
Oregon	1,521,341	39.6
Washington	2,378,963	37.0

The average increase in the United States as a whole was 14.5 per cent in this 10-year period.

According to recent studies of the trend of industry in the United States, the Pacific Coast Area, including Oregon and Washington, appears to be the center of greatest industrial growth during the last 10 years. In November 1950 the Federal Power Commission approved plans to supply gas to the New England territory in the United States, and thus the Pacific Northwest territory to be reached by the proposed Westcoast System is the only remaining large industrial and populous area presently not served by natural gas in the United States.

Basis for Estimated Gas Sales in Territory to be Served.

Estimates of the market for natural gas in the territory to be served are summarized in the Table entitled "Estimated Market for Natural Gas in the Fifth Year of

Operation". (That follows a map on page 18.) These estimates are the result of investigation and study of the territory to be served, its population, industrial development and use of competing fuels. Initially we reviewed a study "Market for Natural Gas in the Pacific Northwest" prepared by Ebasco Services, Inc., in April 1948. This study was made for and in cooperation with several of the manufactured gas utility companies from Vancouver south to Portland, Ore. Supplementing this review, engineers from our staff made an inspection of the territory, interviewed officials of about 70 industrial companies, conferred with officials of the companies now distributing manufactured gas in the principal cities, and obtained information as to the present use of manufactured gas among the various classes of consumers. During this market study, which has continued intermittently over the last year and a half, we reviewed estimates of the future use of natural gas as prepared by the various manufactured gas utility companies. The market estimate presented herein is the result of all the studies referred to above, supplemented by the experience of Ford, Bacon & Davis in the natural gas business for more than 25 years.

The total estimated sales of 63,788,900 Mcf. in the fifth year include company estimates for the Seattle Gas Company, the Bellingham Gas Company and Portland Gas & Coke Company. In each instance those company estimates in total are reasonably close to independent estimates by Ford, Bacon & Davis, and in the light of past experience these estimates should be conservative. For the cities of

Vancouver, Everett, Tacoma, Olympia and Centralia-Chehalis sales have been estimated at a higher volume than company estimates to provide for an almost certain demand for greater sales for space heating. For communities not served with manufactured gas and for Longview-Kelso the estimated sales are based on population data and a conservative use of natural gas.

Competitive Fuels

Throughout the market area to be reached by the pipelines of Westcoast Transmission Company, Limited, and its United States affiliate, the principal competitive fuels for domestic, commercial and industrial use are coal and fuel oil. In certain parts of the territory, particularly in the Vancouver and Seattle areas, wood is also an important sourse of fuel, although the use of wood for fuel is declining and the available quantity is expected to be progressively less in future years.

The cost of various fuel in the market areas to be served, and the equivalent cost per million Btu (equal to 1 Mcf of 1,000-Btu natural gas) is summarized as follows. There follows a comparison of fuel costs based on prices in the late fall of 1949.

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Fuel Costs per 1,000,000 Btu
in Late Fall of 1949

		Vancouver Area	United States Area
Fuel Oil	- Domestic	$0.90 to $1.00	$0.78 to $1.06
	- Industrial	.38 to .48	.22 to .38
Coal	- Domestic	.62 to .71	.66 to .73
	- Industrial	.39 to .55	.33 to .56
Wood	- Domestic	.32 to .37	.38 to .75
	- Industrial	.13 to .14	.13 to .16
Manufactured Gas (A):			
	Domestic - General Use	$2.98	$2.37 to $4.32
	- Space Heating	$1.46	1.28 to 2.04

Note: (A) Based on estimated average consumption and existing rate schedules.

The price of natural gas is expected to be competitive with all of the foregoing fuel prices, except wood and the cheaper grades of heavy fuel oil. As stated above, the use of wood for fuel is declining and is generally limited to localities near the lumber industry. The principal industrial fuel is heavy fuel oil, particularly the Bunker "C" grade, for which prices have fluctuated considerably since World War II. To illustrate, in Seattle, Wash., Bunker "C" fuel oil prices approximated $2.50 per barrel in 1948 and declined to $1.50 and $1.60 per barrel in the early part of 1950. During 1950 and in 1951 there have been several increases to a recent level of about $2.50. By contrast the prices of fuels for domestic use have held fairly steady over this period, with the current trend being toward some increases.

Domestic Use of Gas

The extent to which manufactured gas is now

used in the territory to be supplied by Westcoast Transmission Companies varies considerably between different utility companies. The variation in use reflects the comparative prices of manufactured gas with competitive fuels, competition between electricity and gas for cooking and hot water heating, and financial history of the gas companies.

Based upon the estimated population in 1948 and the actual number of consumers and volumes of sales as reported by the manufactured gas utility companies, the following table illustrates the relative use of manufactured gas for domestic purposes in the principal market areas.

(Go to page 1455)

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This Table shows for the cities of Vancouver, Bellingham, Everett, Seattle, Tacoma, Olympia, Centralia-Chelais, Kelso-Longview and Portland, the actual number of consumers, the percentage saturation based on the estimated number of families in the 1948 population, the actual Mcf per consumer as reported by the companies, and the corresponding equivalent in 1000 Btu natural gas.

Use of Manufactured Gas
for Domestic Purposes - 1948

Area	Number of Consumers	Saturation (A)	Mcf per Consumer: Actual Various Btu	Mcf per Consumer: Equivalent to 1,000-Btu Gas
Vancouver	48,310	34.5%	31	14
Bellingham	1,607	15.7	11	11
Everett	1,605	14.7	24	24
Seattle	38,742	25.1	63	31
Tacoma	8,981	18.2	63	29
Olympia	1,313	26.3	53	24
Centralia-Chehalis	664	15.2	25	23
Kelso-Longview	530	6.2	23	27
Portland	96,001	51.2	72	41

Note: (A) Ratio of number of consumers to estimated number of families in the estimated 1948 population.

Because of the high cost of manufactured gas its use for space heating by domestic consumers is not very great. In Vancouver and Bellingham less than 2 per cent of the total domestic customers use gas for space heating. By contrast, the usage in Tacoma is 24 per cent. For other communities the respective percentages are: Olympia 23, Portland 21, Seattle 16, Centralia-Chehalis 15, and

C. R. Sample.
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Everett 4.

With the introduction of natural gas into these areas at a cost competitive with coal and fuel oil, it is certain that the demand for natural gas for space heating by domestic consumers will be substantial. Cleanliness and convenience of high-Btu natural gas for domestic use are quickly established in the minds of the public and frequent experience in reeent years has shown that communities with natural gas cannot keep pace with the demand for domestic space heating. Estimates of the use of natural gas are based on recognition of this demand for space heating.

In condensed form, the 5th year estimate results in expected domestic use of natural gas by communities as follows:- There we show for the principal communities the estimated saturation in the 5th year, the ratio of space heating customers to total domestic consumers, and the average use per customer in Mcf. The ranges there are from 51 and 52 up to 64 Mcf per customer per year in the 5th year.

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Estimated Domestic Use of Natural Gas
in Fifth Year of Operation

	Saturation (A)	Ratio of Space Heating to Total Domestic Customers	Average Use per Customer (Mcf)
Vancouver	47.4%	36%	52
Bellingham	71.8	38	54
Everett	43.8	43	64
Seattle	36.3	43	51
Tacoma	49	49	57
Olympia	62.7	39	48
Centralia-Chehalis	45.6	47	59
Portland	63.6	54	64

Note: (A) Ratio of estimated number of consumers to estimated number of families in fifth year of introduction of natural gas.

For comparison, natural gas sales in 1948 per domestic customer in various areas of the United States are reported as follows: And it will be noted that the use per customer in Mcf ranges from 53.5 in Michigan to as high as 209.0 in North Dakota.

Natural Gas Sales per Residential Consumer
in the United States - Year 1948

State	Mcf
New York	71.8
Pennsylvania	91.2
Michigan	53.5
Ohio	90.2
Kansas	122.7
North Dakota	209.0
Oklahoma	104.3
Colorado	123.3
Montana	174.7
California	68.6

The resulting estimates of total domestic requirements by market areas, divided between space heating and general use, are shown in a following table previously referred to.

Q MR. C. E. SMITH: On page 11, you did not intend to change the word "consumer" to "customer", did you? You read it as "customer"?

A No, customer and consumer, if I read it as customer, they mean the same thing.

Q Yes.

Q THE CHAIRMAN: Mr.Sample, is that comparison based on 1,000 Btu gas?

A It is natural gas only. There will be, I assume, 1,000 Btus, it will be 1,000 Btu gas, taking the A.G.A. standard.

Since preparing this, I have checked the 1950 use of residential consumers in the United States, and in every instance the use was substantially higher than in 1948. Just a couple of illustrations: In New York the increase was up to 81 as compared to 71.8; Pennsylvania went up to 121 as compared with 91.2; Colorado went up to 131 from 123.3; and in Ohio it went up to 124 from 90.2. That is the Table on Page 18.

Commercial Sales

Commercial sales of natural gas are not easily related to population, although usually they bear some relation to domestic sales in comparable territories. The relation is affected by population characteristics (urban or rural), development of market, and average temperature conditions. The general experience is to find the ratio of commercial consumption to domestic consumption lower as the full domestic market is developed. This is illustrated in the territory under consideration by noting that in Vancouver commercial sales in 1948 amounted to 61 per cent of domestic sales, and in Seattle the ratio was 57 per cent,

whereas in Portland it was about 33-1/3 per cent.

For cities in the United States having natural gas the ratios of commercial sales to domestic sales for 1948 were in the neighbourhood of 20 per cent for New York, Pennsylvania, Michigan and Ohio and in the range of 44 to 55 per cent for Oklahoma, Texas, Colorado, Montana, Wyoming and California.

Estimates of the sale of gas to commercial consumers in the fifth year after introduction of natural gas are generally within the expected range and are summarized as follows: This little Table gives the ratio of commercial Sales to domestic sales in each of the cities to be served with natural gas in the fifth year.

Ratio of Estimated Commercial Sales to Domestic Sales in the Fifth Year

Location	Ratio
Vancouver	28.1%
Bellingham	41.8
Everett	26.2
Seattle	50.0
Tacoma	24.7
Olympia	33.3
Centralia-Chehalis	30.8
Portland	25.1

Industrial Market

In connection with estimates of the probable use of natural gas for industrial purposes, a review was made of data assembled by others showing the total fuel consumption in million Btu equivalent by the larger industries in the marketing area; that is, industries whose annual fuel cost is in excess of $5,000.00. This was supplemented by field studies by engineers of Ford, Bacon & Davis, Inc.

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From various data the annual industrial fuel requirements of large industrial consumers in the Westcoast market area were found to be in excess of 64 trillion Btu, or 64 million Mcf of natural gas equivalent, segregated as follows:- This Table shows the industrial fuel requirements in the equivalent MMcf, and is subdivided between Light and Heavy fuel oil, coal and wood, for the principal cities.

Industrial Fuel Requirements - Equivalent MMcf

	Fuel Oil				
Area	Heavy	Light	Coal	Wood	Total
Vancouver	1,600	261	2,053	1,140	5,054
Bellingham	1,180	(A)	(A)	1,554	2,734
Everett	2,154	(A)	(A)	5,062	7,216
Seattle	7,803	568	4,445	296	13,112
Tacoma	4,440	450	(A)	2,650	7,540
Olympia-Chehalis	474	52	(A)	(A)	526
Kelso-Longview	840	4	(A)	12,475	13,319
Portland	10,900	1,346	(A)	2,500	14,746
Total	29,391	2,681	6,498	25,677	64,247

Note: (A) Use of fuel under this heading not available.

As noted above, information relating to the use of coal is incomplete. After giving consideration to the large number of small industrial plants, and the obviously greater volume of coal used than is reflected above, and allowing for normal growth of industry, it appears that industrial fuel requirements will be of the magnitude of 100 trillion Btu or 100 million Mcf of natural gas in the fifth year of operation of the proposed pipe line system.

The estimate of sales of industrial

gas in the fifth year as shown on the table attached, amounts to 33,739,700, of which 32,530,700 Mcf is estimated for the area from Vancouver south to Portland. This is equivalent to slightly over 30 per cent of the probable potential market in the fifth year.

Rate of Attaching Fifth Year Load

In studies made by Ford, Bacon & Davis, Inc., the rate of attaching the fifth year load in a territory where natural gas is first made available (usually involving conversion from manufactured gas to natural gas) is affected by a variety of factors, such as general business conditions, the extent of development of manufactured gas business, relative number and size of industrial consumers, and the sales promotion effort by the utility company to sell the newly available natural gas commodity.

For the territory to be served by Westcoast Transmission Company Limited and its United States affiliate, a reasonable expectation of the rate of attaching the fifth year load would be as follows: First year 35 per cent, Second Year 60 per cent, Third Year 80 per cent, Fourth Year 90 per cent, and Fifth Year 100 per cent. The actual percentages as developed for the System design reflect a combination of the above-mentioned percentages for parts of the load and utility company estimates for substantial parts of the load.

A factor of considerable importance in the rate of attaching the natural gas load is the planning on the part of the local distributing companies during

the interval between the beginning of construction of the system and the date of delivery of natural gas. During this period the distributing companies can do many things to prepare for increased sales, such as extending and adjusting the local distribution system, signing up new customers, and laying plans for prompt adjustment of consumers' appliances for conversion to the use of natural gas.

Degree Days in Relation to Heating Load

Average degree days by months in the cities of Vancouver, Seattle, Tacoma and Portland are shown in the following table: I think the Table is self-explanatory.

Average Degree Days by Months.

Month	Vancouver	Seattle	Tacoma	Portland
January	819	759	786	775
February	705	637	658	616
March	636	595	612	533
April	449	436	455	368
May	283	299	313	237
June	135	160	171	108
July	42	67	75	27
August	48	69	75	28
September	192	170	190	106
October	499	365	390	292
November	632	554	581	538
December	768	704	737	725
	5,118	4,815	5,043	4,353

Generally, the consumption of fuel for heating varies from month to month and from year to year in accordance with the variation in degree days. For the most part, climatic conditions in this area do not show the extreme range in temperatures between winter and summer that is found in similar latitudes further inland. It is

rare in the Seattle, Tacoma, and Portland areas to have winter temperatures below 15 to 20 degrees Fahrenheit, although records going back 57 years show an absolute lowest temperature of 3°F. in Seattle. In Vancouver, the severest winter temperatures are usually about 8 or 9 degrees below temperatures in Seattle, the lowest temperature recorded in 42 years having been 2.3 degrees Fahrenheit. Normal temperatures from spring to fall are lower than at inland points of similar latitude so that usually there are some degree days in every month of the year. The average of the lowest daily mean temperatures over a period of several years is 21.9 degrees Fahrenheit in Vancouver and 26.5 degrees Fahrenheit in Portland, Oregon. The lowest daily mean temperatures in this same period were 10 and 15.5 degrees, respectively. Based upon an analysis of degree days and average coldest days, it is estimated that a reasonable heating load factor for design purposes is about 29.5 per cent, which is close to the actual weighted estimate for the entire system. For general consumption by both domestic and commercial users and for non-interruptible industrial load, a load factor of 75 per cent has been adopted for design purposes. The result of applying such factors to estimated loads gives a maximum day requirement for the system of 269,112 Mcf as compared with 174,764 Mcc per average day, or an average load factor of 64.9 per cent.

By allowing for nominal peak shaving in Seattle, Vancouver, Olympia, Centralia-Chehalis and in Portland, the maximum-day demand on the pipe line system is reduced from 260,112 to 228,312 and improves the load factor

to 76.5 per cent. In each instance where peak shaving has been considered, the local utility has manufactured gas facilities which could be readily adapted to supply from 10 to 20 per cent of the maximum day's requirements during the winter months.

On page 18 is given the estimated market for natural gas in the fifth year of operation. We have a summary for all the cities where it is reasonably certain that natural gas would be supplied in the fifth year, including some of the smaller cities like Princeton, Kamloops and Hope, that is in British Columbia, and in the United States Vernon, Washington, and St. Helen's, Oregon. For each of those locations we have the estimated fifth year sales in this Table subdivided between domestic, commercial and industrial, and the domestic and commercial in turn being subdivided into space heat and general use, and the industrial between firm industrial load and interruptible load. And then we give total sales for each city, an allowance for unaccounted for and company use, the total send-out, the maximum day and the maximum day less peak shaving.

Q MR. McDONALD: Mr. Sample, the submission you have just made is almost identical with your previous testimony, except for requirements that have been made having regard to more information available from time to time?

A That is correct. And, as pointed out, substituting the company's estimates in the cases of Seattle, Bellingham and Portland.

Q That is, the utility company's estimates?

A Yes, the utility company's estimates.

Q And you have made your own estimate with regard to the City

of Vancouver?

A Yes. In the City of Vancouver it is my own estimate based in part on company figures, but essentially they are similar to what I had before.

Q And, of course, this market here involves only the West-coast, or the part of the market in British Columbia and on the western side of the Cascade Mountains in the States of Washington and Oregon?

A That is right. I might point out, again referring to page 18, that there are provisions for sales unallocated, unallocated sales in Canada of 913,700 Mcf, and likewise 648,000 Mcf unallocated in Washington and Oregon. That is to take care of additional towns along the line and the industrial use that may come up in the fifth year.

Q Thank you.

THE CHAIRMAN: Anyone wish to question Mr.Sample?

.....

CROSS-EXAMINATION BY MR. NOLAN:

Q Mr.Sample, would you be good enough to look at page 18 again, the total there under "Industrial"?

A Yes, sir.

Q And under the column entitled "Interruptible"?

A Yes.

Q I see opposite Princeton, B.C., the figure there of 1,200,000 Mcf of an interruptible load.

MR. C. E. SMITH: That is the only question I had.

A That is the Granby Consolidating Mining Company.

Q MR.NOLAN: And then looking down a little further, at Vancouver, I see there is a figure of 1,692,000 Mcf designated as an interruptible load? What is that?

A Well, the total industrial load, of the total industrial load, that is our estimate of how much in the Vancouver area could be supplied on an interruptible basis.

Q Out of the whole?

A Yes, out of the whole.

Q And is that true of the figure opposite Portland, Oregon, which is the second-last line from the bottom, the figure being 10,550,000 Mcf.

A Yes.

Q I see. Thank you.

MR.PORTER: Mr. Chairman, if Mr. Sample is here a little later, I may have a question or two to ask him with regard to the basis on which some of the figures were developed, but I am unable to present them now because the gentleman who was advising me is not here, he is in Washington, notwithstanding the vigour of my protests. However, there is one question I would like to get clear in passing.

.....

CROSS-EXAMINATION BY MR.PORTER:

Q If you will look at the column entitled "Total Sales", can you tell me, or break that down for me so that we will have the total sales in Canada as compared to total sales of the line?

A Very easily. If you will add together the first five figures. . .

MR. McDONALD: Six figures.

A You have to add the six figures, taking the locations there plus the unallocated, the first six columns are Canada, with the balance the United States.

MR. PORTER: Thank you very much.

Q MR. McDONALD: That is the total set out on page 4, isn't it, Mr.Sample?

A I believe it is in the summary. It should have been.

MR. McDONALD: Mr.Sample also will be here for the balance of the week. If anybody wishes to deal with this exhibit I will have him available.

MR.MARTLAND: I would like to have the same opportunity as Mr. Porter, sir.

THE CHAIRMAN: All right.

.....

EXAMINATION BYMR. C. E. SMITH:

Q I might ask one question if counsel are through? Maybe this should be directed to your counsel, Mr. Sample, but in the previous submissions you dealt with two, what I might call important places, that are not in this one, namely Spokane and the plant at Hanford, is it?

A Hanford.

Q I see Mr. McDonald getting up, maybe I should address it to the applicant and not to you. Could anybody tell us what the situation is about any markets for those two places?

MR. McDONALD: Mr.Chairman, the situation is this: As indicated in our revised application, we really have two applications before the Board, dealing with this and the Pacific Northwest, and there will be a submission made on it and it will be available to deal with the markets in the inland empire area, which will involve parts of Montana, Idaho and the State of Washington. That, sir, is in the mill.

MR.C. E. SMITH: In the mill or in the mail?

MR. McDONALD: In the mill.

(Go to page 1469)

THE CHAIRMAN: Will you proceed with the next, Mr. McDonald?

W. B. POOR, having been first duly sworn, examined by Mr. McDonald, testified as follows:-

Q Mr. Poor has been qualified, sir. I think, Mr. Poor, if you would deal with Pipe Line Routes, commencing at page 19 of Exhibit 44 and being completed at page 34. I think that the most expeditious way of placing the evidence before the Board would be to read from page 20 to the top of page 26. I do not think it is necessary to go into the detailed description of the route unless you have any comment to make.

A Westcoast Transmission Company, Limited.

PROPOSED ROUTE OF NATURAL GAS TRANSMISSION SYSTEM

General Description of Route

The route of the proposed main transmission line from its starting point in the Province of Alberta through British Columbia to the city of Vancouver, and to a point on the United States-Canada international border is shown on the map following entitled "Proposed Natural Gas Pipe Lines to Pacific Northwest". (That map being shown directly following page 34)

The main line will originate in the Province of Alberta at a point approximately 3 miles from the British Columbia-Alberta boundary, almost due east of the town of Rolla, B.C. For approximately 133 miles the proposed route follows a westerly course (slightly southwest) passing approximately 6 miles north of Dawson Creek, B.C. and crossing the Pine River just north of the town of East Pine; thence the route follows close to the highway, passing near the

village of Little Prairie to the Pine Pass. Through the pass, the route will generally parallel the newly-constructed highway.

West of Pine Pass the proposed route turns south, passing near the town of Fort McLeod, Summit Lake and Salmon Valley and crosses the Fraser River just east of the city of Prince George. From Prince George the route continues south, passing east of the town of Quesnel and then following close to the highway and the railroad, passes to the east of Alexandria, Soda Creek and Williams Lake.

From Williams Lake, the route extends in a southeasterly direction passing near 100 Mile House and North Bonaparte. From a point near North Bonaparte, this proposed route will extend in a southerly direction through a valley and will cross the Thompson River just west of the west end of Kamloops Lake and just west of the town of Savona. From Savona, it will continue in a southeasterly direction following fairly close to the road and will pass near Mamette Lake and just west of the town of Merritt.

From Merritt, the route will parallel the Canadian Pacific Railroad most of the way through the Coquihalla Pass, passing near the towns of Kingsvale, Brodie and Jessica to a point south of Hope, and thence in a southwesterly direction following fairly close to the highway and railroads and passing near the towns of Laidlow, Cheam View and Chilliwack to a point about six miles from Sumas, Washington. At this point, a branch line will continue into the city of Vancouver and the main line will continue south to cross the International Boundary about five miles east to the town of Sumas, Wash-

ington. The total length of the main transmission system in Canada as described above is estimated to be 723 miles, subdivided as follows:

Q MR. C. E. SMITH: Excuse me, is there any real distinction between what you have read and your previous submission?

A One only, Mr. Smith, and that is in the second paragraph on page 21, from Merritt to Hope wherein we have given consideration to construction of a pipe line through the Coquihalla Pass.

Length of Main Transmission System in Canada

Location	Length (Miles)
Province of Alberta	3
British Columbia-Alberta border to International Boundary near Sumas	680
Branch to Vancouver	40
Total	723

Laterals to reach markets along the main line are estimated at 84 miles, making a total of 807 miles of pipe line in the proposed system in Canada.

Selection of Route

The proposed route, generally described above, has been selected by engineers of Ford, Bacon & Davis, Inc., and associated consultants after extensive surveys and studies of the territory to be traversed. Before selecting this route numerous field inspections were made of several possible routes through the territory. These surveys were supplemented by studies of topographic maps and other field survey notes

in a final selection of the route. Based on long experience in the selection of routes and actual construction of natural gas pipe lines, it can be stated that the proposed route is entirely feasible and that there are no sections or places along the proposed route that are unduly hazardous or that present constructions problems which have not been experienced on similar cross-country gas transmission pipe lines built in the United States.

The sections from the Alberta-British Columbia boundary to the eastern foothills of the Rocky Mountains, from Fort McLeod to a point south of North Bonaparte, and a portion of that section between Savona and Merritt, and that section beginning at a point some 10 miles south of Hope and extending to the International Boundary, and the route of the line into Vancouver, are in what could be termed as good to fair pipe-line-laying country. In several sections, namely, through the Pine Pass, a portion of the section between Savona and North Bonaparte, a part of the section between Merritt and Hope, and for a short distance just southwest of Hope, construction of a pipe line will be most difficult. However, as stated before, these areas are no worse than have been encountered in the building of similar lines in the United States. For the most part, the grades are fairly easy and the route follows highways, roads, railroads and river valleys.

A summary by major sections of the proposed route showing for each section the length, type of clearing for right-of-way, kind of excavation and classification of terrain is given in the following table entitled "Classifi-

cation of Surface and Soil Conditions Along Proposed Pipe Line Route". In the 683 miles of main line, these general features are summarized as follows:

Q MR. C. E. SMITH: What are these figures in the left-hand margin?

A Those are just our code figures for trying to keep the various paging together.

Q I do not need to worry about them?

A No, they have no significance.

MR. McDONALD: Might have something to do with costs.

MR. C. E. SMITH: I would be interested in that.

A

Summary of Surface and Soil Conditions Along Proposed Route

	Miles	Per Cent
Clearing:		
Open	170	24.9%
Light	203	29.7
Medium	200	29.3
Heavy	110	16.1
Total	683	100.0%
Excavation:		
Earth	325	47.6%
Gravel	328	48.0
Rock	30	4.4
Total	683	100.0%
Terrain:		
Flat to gently rolling	283	41.4%
Gently rolling to rolling	300	43.9
Rolling to Steep	100	14.7
Total	683	100.0%

General

Approximate elevations (in feet above sea level) of points along the proposed route are shown in a Table

entitled "Approximate Elevations Along the Proposed Route of the Main Transmission Line". Starting at an elevation of 2,500 feet, the proposed route reaches a high point of about 3,000 feet at Mile Post 88, crosses Pine Pass at 2,850 feet, and drops to 1,760 feet near Soda Creek, rises to 3,500 feet at Mile Post 459 to 495, near North Bonaparte and Red Lake. At the Thompson River Crossing near Savona, the elevation drops to 1,050 feet and then rises in the next 25 miles to approximately 3,500 feet. From here the line would go down grade to Merritt at an elevation of about 1,950 feet. The highest point to be surmounted in the Coquihalla Pass is 3,650 feet above sea level and from here the elevation drops all the way to Hope, where it is about 160 feet.

Location of Starting Point of Main Line and Points of Crossing the International Boundary.

The starting point of the main line is in the Province of Alberta and will be in the NW 1/4 of Sec. 2, Twp. 80 N, Range 13 W of 6th Meridian.

The route of the main line will cross the Alberta-British Columbia boundary through the SW 1/4 of Sec. 32, Twp 79 N, Range 13 W of 6th Meridian.

The main line crossing of the International Boundary near Sumas, Washington will be on the south line of SW 1/4 of Sec. 4, Twp 19, East of Coast Meridian.

The western end of the line to Vancouver will be near the Westminster end of the Pattullo Bridge on the west bank of the Fraser River. This Vancouver lateral intersects the main line in the SW 1/4 of Sec. 10, Twp 19, ECM.

Pipe Line Lengths

The pipe line lengths as shown herein and used in estimating the costs of this system were arrived at by accurately scaling the line as laid out on the best available maps. To these scaled distances have been added percentages to allow for horizontal and vertical deviations. Before actual const uction is commenced a detailed survey will be made, and when the exact location of the line is determined, it is expected that these lengths will be shortened somewhat.

There then follows a more detailed description of the route and the next succeeding pages discuss the route of the line section by section. That follows through for the next succeeding pages, through Page 31. Page 32 contains a table setting forth the approximate elevations along the proposed route of the main transmission line. Pages 33 and 34 gives climatic data, a summary of temperatures along the proposed route of the main transmission line, and on the following page a map of the route of the line.

Detailed Description of Route

A more detailed narrative description of the proposed route of the main transmission line is as follows:

(a) Mile Pole 0 to British Columbia Boundary (Distance 3 miles)

Through this section, the line will be in flat to gently rolling terrain, part in open pasture and part in thin wooded areas. Only earth excavation is expected in this section.

(b) Alberta-British Columbia Boundary to Pine River (Distance 50 Miles)

Through this section, the line will be in flat to gently rolling hills; some rich farming land, semi-developed; open to light clearing. The soil consists mostly of earth and clay with some gravel near East Pine Post Office. The line will cross Pine River near East Pine. This river is about 400 feet from bank to bank. The bottom is of gravel and boulders.

(c) Pine River to about Longitude 122° (Distance 35 miles)

Through this section, the line will be in generally light to medium clearing of spruce, jack pine and poplar. There are some open places and a few farms and pastures. There is some rock out-cropping just east of Commotion Creek but, generally, the excavation will be earth and clay with some gravel and sand. The terrain is gently rolling to rolling hills and plateaus.

(d) Longitude 122° to Pine Pass (Distance 45 miles)

Through this section, the line will be in generally light to medium clearing with about 10 to 12 miles of heavy clearing. The timber is spruce, jack pine and some poplar. The terrain is rolling hills to steep and rough. Elevation of the new road at Summit is 3,060 feet and elevation of the Pass is shown as 2,850 feet above sea level. Some of this section is in partly burned-over timber land. Excavation will be in clay and gravel with some spots of solid rock. For the purpose of estimating costs in this section, 7 miles of rock ditch has been estimated. There is some rough

going in this section.

(e) Pine Pass to Fort McLeod
(Distance 36 Miles)

In this section there is approximately 14 miles of heavy clearing of spruce and some 20 miles of light to medium clearing of spruce, jack pine and alder. There are a few spots with light or no clearing, some of which has been burned over. The terrain is rolling hills with occasional rough and steep areas. Excavation generally will be in clay and gravel with boulders, although for estimating purposes an allowance has been made for 5 miles of rock ditching in this section.

(f) Fort McLeod to Summit Lake
(Distance 55 Miles)

Through this section there are rolling hills with medium to heavy clearing in spruce. There is some lodge pole jack pine, with light to medium clearing. Excavation will be in sandy clay with some gravel. Some sections have boulders overlying clay hills. The valley between Davey and Carey Lakes along Crooked River is wet, with some bad going.

(g) Summit Lake to Prince George
(Distance 27 Miles)

Along this route there are some small abandoned farms and active farms near the road. Greater part will be open to light to medium clearing of spruce, pine and poplar. Excavation will be in sandy clay with some gravel. The terrain is rolling hills with some swampy sections extending from the East side of the road to the toe of the hills.

(h) Prince George to Cinema
(Distance 53 Miles)

The terrain in this section is rolling hills, benches and plateaus. Some spots are very choppy and irregular. Excavation will be in clay and gravel. There are a few small farms and open sections but mostly the line in this section will be in light to medium clearing with a few miles of heavy or dense clearing. The timber is pine, spruce and poplar.

(i) Cinema to Quesnel (Distance 16 Miles)

The terrain is rolling hills, fairly good pipe line country. There are open pasture areas and some clearing, light to medium. The excavation will be in a sandy soil with gravel.

(j) Quesnel to Soda Creek
(Distance 47 Miles)

The terrain is from flat to gently rolling to rolling hills. There are a few choppy and irregular spots, scattered woods to medium clearing, fair pipe line country. The excavation will be in sandy soil with gravel and some overlying boulders. There are a few dry canyons to be crossed in this section, which probably should be made with overhead crossings.

(k) Soda Creek to Williams Lake
(Distance 16 miles)

The terrain is open to light and medium clearing, flat to rolling hills. Excavation will be in sandy soil and gravel.

(m) Williams Lake to 100 Mile House
(Distance 50 Miles)

Generally, this section is flat to gently rolling. Good pipe line country. Excavation will be in sandy soil with gravel, some boulders. For most part, it is open to medium clearing. No rock.

(n) 100 Mile House to North Bonaparte
(Distance 26 Miles)

Through this section, the line would be in generally rolling to rolling terrain. Fairly good pipe line country. Excavation will be in clay and gravel. The timber is light to medium - no rock in evidence.

(p) North Bonaparte to Thompson River
near Savona (Distance 51 Miles)

About half of this section on the northwestern end is plateau country having a few large and many small lakes. The timber is light to medium. There are a few isolated farms and dirt roads in evidence. In the vicinity of North Bonaparte, it is quite swampy. There is no rock in evidence. In the southern portion of this section the line will traverse a narrow valley for a part of the way. The hills become steeper and there is rock in evidence. The timber is heavier and the valleys have numerous small lakes.

(q) Savona to Merritt
(Distance 52 Miles)

This section is rolling with some parts steep and rough. It is mostly grazing land upon the higher benches and plateaus. There will be some light to medium clearing.

W. B. Poor,
Dir. Ex. by Mr. McDonald.

Excavation will be in sandy soil with gravel and boulders and with some solid rock.

(r) Merritt to Hope (Distance of 72 Miles)

This section will be the most difficult for pipe line construction thus far. For the most part, the line will lay in the river valley of the Cold Water River and the Coquihalla River. There are places where this valley narrows down and pinches out and the route of the line will have to cross over noses and some rougher terrain and part time will lay along the benches. On the north end of this section between Brodie and Merritt, there is some flat to gently rolling easy going. For the most part, the clearing will be in medium timber with some heavy timber. Excavation will be in clay and gravel with stretches of solid rock.

(s) Hope Tap to Chilliwack Tap (Distance 32 Miles)

For the first 8 or 10 miles in this section, after turning south at Hope, there is some rough country with steep, high, rough terrain, some rock ditch and dense clearing. The remaining portion of this section is in flat to gently rolling terrain. The excavation will be in earth and it is mostly open farms and grazing lands.

(t) Chilliwack Tap to International Boundary (Distance 17 Miles)

This section is all in flat to gently rolling terrain - mostly cultivated and pasture lands. Excavation will be in earth.

W. B. Poor,
Dir. Ex. by Mr. McDonald.

(u) Vancouver - New Westminster Lateral
(Length 40 Miles)

The pipe laying conditions for this branch line will be practically the same as the above described section from Chilliwack to International Boundary. The route of the pipe line through this section will parallel and follow fairly close to Highway No. 1.

Westcoast Transmission Company, Ltd.

APPROXIMATE ELEVATIONS ALONG THE
PROPOSED ROUTE OF THE MAIN TRANSMISSION LINE

Mile Pole No.	Approximate Elevation)Feet)	Main Line Identification
0 + 00	2,500	Three miles east of B.C. Boundary, due east of Rolla, B.C.
3	2,500	Alberta-British Columbia Boundary
38	2,500	Groundbirch
53	2,000	Pine River
88	3,000	Longitude 122° 0'
100	2,850	Pine Pass
169	2,450	Fort McLeod
224	2,315	Summit Lake
251	2,200	Prince George
304	2,000	Cinema
320	1,800	Quesnel
367	1,760	Soda Creek
383	1,925	Williams Lake
433	3,000	100 Mile House
459	3,500	North Bonaparte
495	3,500	Red Lake
510	1,050	Savona - Thompson River
600	3,650	Coquihalla Pa s
638	160	Hope Tap
666	35	Chilliwack Tap
681	35	Vancouver-New Westminster
683	35	International Boundary

MR. McDONALD: Sir, I was wondering about the matter of cross-examination, cross-examination in sections or on the report of Mr. Poor as a whole, whichever counsel

desire.

THE CHAIRMAN: Is Mr. Poor going to deal with the balance of this exhibit?

MR. McDONALD: Yes, sir.

MR. C. E. SMITH: I wonder before you leave that, would he tell the difference between what he has read and referred to and the ones you submitted about a week ago. I notice on your table on Page 19 of the first submission, Page 24 of Exhibit 44, there are slight differences in the percentages. I was wondering how in the intervening time they could figure out differences in percentages.

MR. McDONALD: The differences in regard to changing route in one section of the line only.

A The main difference in these percentages is the change in the proposed route line from Merritt to Hope through the Coquihalla Pass, as compared with the route from the main line from Merritt via Princeton to Hope.

Q MR. McDONALD: In the first submission the line then followed from Merritt to Princeton?

A That is right.

Q And back from Princeton northwest to Hope?

A That is correct.

Q In this particular submission the line runs from Merritt almost directly west to Hope?

A Runs from Merritt almost directly west to Hope through the Coquihalla Pass, thereby materially shortening the length of the line.

MR. C. E. SMITH: Does that account for the slight differences in percentages?

A Yes.

Q MR. McDONALD: Then there will be a branch line from near Merritt southeast to Princeton?

A That is right.

Q Which will be developed as you go along.

THE CHAIRMAN: Would anyone like to cross-examine on each part?

CROSS-EXAMINATION BY MR. NOLAN:

Q I wonder if you would tell me, this is only one of two routes which you propose to describe?

A This is the route which we propose to describe at this time from the Peace River area to the Pacific Northwest.

Q Do I understand that at some other time you propose to describe another route?

A No.

Q Well in your application - and I have not got it before me - it seems to me that there was a route from Pincher Creek through the Kootenay Pass which linked up with this line somewhere in the vicinity of Princeton, is that right?

MR. McDONALD: There is no suggestion of that in the application. The route from Pincher Creek terminates about Spokane and Trail. There is no connection with this route in the Peace River given in Westcoast's.

MR. NOLAN: Is there to be a route from Pincher Creek?

MR. McDONALD: Certainly.

MR. NOLAN: In addition to this?

Mr. McDONALD: Yes.

MR. NOLAN: And that is to be described later, is it?

MR. McDONALD: Yes. There is no connection.

Q MR. NOLAN: Do I understand from your evidence, Mr. Poor, that you have completely abandoned any idea of going through the Allison Pass?

A We have at this time, yes.

Q Why?

A Because so much consideration has been given by other companies to the utilization of the Coquihalla Pass that it is our firm conviction that eventually there are going to be two lines through there, which, in addition to the railway, takes away the major objection we had to a single pipe line through there, which was a matter of operation and maintenance rather than a matter of construction, and the capital savings in our opinion offset any additional maintenance costs that would be incurred.

Q Would it be fair to say that you have come to the conclusion that you could not maintain a pipe line through the Allison Pass?

A Oh, no, sir.

Q Well, then, why aren't you building there?

A Because of the capital cost savings to be made by going through the Coquihalla Pass. But the Coq

Q But the Coquihalla Pass you describe as the most difficult portion of the whole line for the pipe line construction?

A That is correct. That is correct, but it still represents a saving of several million dollars.

Q And it has an elevation of 3650 feet above sea level?

A. That is right.

Q I see you say that in places the valley narrows down and pinches out. What does that mean?

A It means that the valley is comparatively very narrow in width.

Q Yes. So that you have to cross over noses?

A Oh, surely.

Q "And some rougher terrain and part time it will lay along the benches." What does that mean? "and part time will lay along the benches"?

A Lay along the benches above the valley bottom.

Q In other words that the line will be constructed on the slope down to the bottom of the valley by constructing a bench?

A No, there are benches there.

Q There are benches there?

A There are natural benches there.

Q And they will be utilized?

A That is correct.

Q What is the nature of the terrain itself through this particular part?

A The nature of the terrain itself through there is a comparatively narrow, rugged pass.

Q A what?

A A comparatively narrow, rugged pass.

Q Is it rock or gravel?

A It has both rock and gravel,

Q It has both rock and gravel?

A That is correct?

Q Have you been through there yourself, Mr. Poor?

A I have not been through that particular pass personally. Our engineers have been through there by a combination of car and railroad handcar and have flown the terrain.

Q Is there a road through that particular pass, this Coquihalla?

A Only a railroad.

Q Does that railroad run at all seasons of the year?

A That railroad runs at all seasons of the year?

Q In the winter?

A It runs in the wintertime, I am so advised, although there are delays from time to time.

(Go to 1487.)

Q There is a tunnel, I understand, there, is there?

A I think there is, yes, sir.

Q Do you know how long that tunnel is?

A No, I do not.

Q MR. McDONALD: Do you intend to go through the tunnel?

A No, I do not.

MR. NOLAN: What is that?

MR. C. E. SMITH: He said he does not want to go through the tunnel.

Q MR.NOLAN: Well, then, when you get to Hope and immediately south of Hope, your line will follow the old route, so to speak?

A That is correct.

Q The previously described route?

A That is correct.

Q And do you propose to bring in evidence as to the route from Pincher Creek to Spokane at this hearing?

A Yes.

M .C. E. SMITH: What do you mean "at this hearing"?

A These hearings.

MR. NOLAN: I meant this year.

MR. McDONALD: The submission with regard to that will be distributed.

MR. C. E. SMITH: You have all been fairly well warned about what you should do.

Q MR. NOLAN: And so far as the Yellowhead route is concerned, Mr. Poor, that, too, has been abandoned by your company?

A It has.

Q Why do you abandon that?

A Because of the location of the reserves.

Q You felt that they were more easily accible through the route which you have described to us from Pouce Coupe?

A That is correct.

.....

EXAMINATION BY MR. C. E. SMITH:

Q With regard to the last answer, Mr. Poor, have you reference to what Westcoast suggested at an earlier hearing when you drew a green or a blue line around some reserves, is that what you had in mind?

A That is correct.

Q That is all.

.....

RE-EXAMINATION BY MR. McDONALD:

Q Mr. Poor, if you will now deal with pipe line design, and if you will just read the first page and then refer to the Tables, the two maps and the flow diagrams, that is from page 36 to page 44 of Exhibit 44.

A Yes.

Westcoast Transmission Company, Limited

PIPE LINE DESIGN

Tne engineering exhibits describing the design of the proposed pipe line system are presented herein under the following headings:

(1) Table entitled "Summary of Maximum-day Requirements by Delivery Points."

(2) Table entitled "Size and Length of Pipe in Transmission System, including Distances Between Principal Features."

(3) Table entitled "Steps in the Addition of Compressor Horsepower"

(4) Table entitled "F.B. & D. Formulas for Design of Pipe Lines"

(5) Map entitled "Transmission System Flow Diagram"

(6) Map entitled "Gathering System Flow Diagram"

The system flow diagrams present the design of the proposed pipe line system for the estimated maximum day during the fifth year of operation. Fifth-year design is generally considered in the industry as a sound basis for development of initial construction.

The tables summarize (a) gas requirements on the maximum day at each delivery point for the first five years of operation, (b) size and length of pipe lines, (c) steps in the addition of compressor horsepower and (d) basic formulas used in the design. These designs were prepared in accordance with present-day standards and practices of the natural gas industry.

Main line pipe is to be fabricated according to API STD 5LX to Grade X52 with the following tensile properties:

Minimum Tensile Strength - psi	72,000
Minimum Yield Strength:	
Longitudinal - psi	44,000
Transverse - psi	52,000
Minimum Elongation in Two Inches	22%

The wall thickness of main line pipe is selected under specifications of the American Standards Association Code for Pressure Piping ASA B31.1.

Page 37 sets out in summary the maximum day requirements by delivery points for the first five years of operation. These are tied in directly with

the markets.

Page 38 is the Table setting forth the size and length of pipe in transmission system, including distances between principal features broken down as between the gathering system in Alberta and the transmission system in Canada.

Page 39 is a continuation . . .

Q MR. C. E. SMITH: Before you leave page 38, is there any distinction between that and the first submission, Mr. Poor?

A That, of course, will take into account the decrease in pipe line distance by utilizing the Coquihalla Pass and in addition thereto the lateral line to Princeton.

Page 39 is a continuation of the size and length of the pipe in the transmission system in Canada. That includes the distances between principal features.

Page 40 is a Table setting forth like data for the main line system in the United States.

Page 41 sets forth the steps in the addition of compressor horsepower in the first five years of operation. It is broken down as between the gathering system in Canada, the gathering system in Alberta, the transmission system in Canada, and the transmission system in the United States.

Page 42 sets forth the basic data relative to the Ford, Bacon & Davis formulas for the flow of natural gas for the design of pipe lines with particular respect to the flow of gas for Alberta gas.

Page 43 sets forth the numerical values

constants that were used in the formula.

Page 44 sets forth a like formula for the determination of compressor horsepower required to compress Alberta natural gas.

The following page sets forth a flow diagram of the transmission system for the maximum-day for the fifth year of operation, setting forth the distances between compressor stations in pipe line miles, the flow of gas in the line, and the suction and discharge pressures at each point of compression, together with installed horsepower and the operating horsepower required to maintain the flow as herein outlined.

The next succeeding map sets forth a flow diagram of the gathering system in Alberta for the fifth year of operation on the maximum day.

Q MR. McDONALD: Mr. Poor. . .

A Pardon?

Q Go ahead?

A I was going to say, indicating thereon the main field gathering line compressor station, the size and length in miles of the various lines comprising the gathering system, and the source of gas supply by fields for the pipe line.

Q There is one thing, in this gathering system flow diagram you have a line running from the main line east and west, south to the Town of Grande Prairie?

A That is correct.

Q Now, is that a gathering line?

A No, that is a delivery line, 10 inches in diameter, approximately, 10 inches in diameter and approximately 47 miles long, serving the various towns along the line indicated as Rycroft,

Esher, Woking, Braeburn, Webster, Sexsmith, Claremont and Grande Prairie.

Q Yes.

Q MR. STEER. What is the size of that line?

A 10-inch.

Q MR. C. E. SMITH: You will tell us the price of that, will you?

MR. McDONALD: Yes. I draw the attention of the Board to that particular line. You will recollect that in the application filed, the company then indicated that it would build that line as part of its project to serve those communities between the proposed main line and the Town of Grande Prairie, with natural gas, and the cost of that line was included in the costs that are going to be dealt with.

Q The cost of that line was included in the cost that you are going to deal with subsequently, Mr. Poor?

A That is correct.

Q In the gathering system costs?

A Yes.

Q Yes.

MR. C. E. SMITH: What did you just say, that it will be included in the gathering system costs?

MR. McDONALD: Yes, and the cost of the pipe line set out in this diagram.

.....

CROSS-EXAMINATION BY MR. NOLAN:

Q What is the amount of gas that goes through that line, Mr. Poor, running down to Grande Prairie?

A 5 million feet per day.

Q 5 million feet per day?

A Yes.

Q That is marked on the map, isn't it?

A That is right.

Q Do you know the number of people who will be served by that line?

A No, I know nothing about the market along that line at all.

Q There are no population figures contained in this report as to those villages that you mention?

A No.

Q Pardon?

A No, sir.

THE CHAIRMAN: Does anybody else wish to question Mr. Poor on this part of the exhibit? Mr.Smith, have you any questions?

MR. C.E.SMITH: No, sir.

.....

EXAMINED BY DR. GOVIER:

Q Mr. Poor, do you have any tabulation of the Alberta communities that will be served and the amount of gas that will be supplied to those communities?

A No, I do not.

DR. GOVIER:
Will there be any such summary, Mr. McDonald?

MR. McDONALD: Well, sir, I just do not recollect whether it is in the previous testimony or not. If it is not, sir, we will prepare and submit a tabulation, a statement which will indicate the Alberta communities that will be taken care of from our line. For instance, at Whitelaw, the Whitelaw field is only 8 miles from one of the larger towns, I think it is Fairmont or Fairview. For instance,

that will still be taken care of by our development but not connected to our line, but we will make and submit that to the Board.

A I think there is something in summary form.

Q Yes.

MR. C. E. SMITH: It would not be in the previous testimony in the same form that is wanted now.

MR. McDONALD: Hardly, but I don't think we missed much in the previous testimony.

MR. C. E. SMITH: Hardly.

MR. McDONALD: We will prepare and submit an exhibit that will deal with that.

Q DR. GOVIER: Mr. Poor, one other question. I notice on the main line you have used a compression ratio of around 1.25. Is that, in your opinion, about the optimum compression ratio? Why did you use that particular figure?

A I would say it is within range of the optimum compression ratio.

Q All right, thank you.

MR. C. E. SMITH: Will Mr. Poor be here later as well as Mr. Sample?

MR. McDONALD: Yes, he will be here the balance of the week.

.....

CROSS-EXAMINATION BY MR. NOLAN:

Q Mr. Poor, I was just wondering if you would help me with one other thing. I was looking at the gathering system flow diagram, and over on the left-hand side, in a little box, I see "Pouce Coupe Compressor Station", and I see the figure opposite the "pumpage" as 237.8?

MR. McDONALD: Pumpage?

MR.NOLAN: Yes?

A That is correct.

Q MR. NOLAN: That is right, Mr. Poor?

A Yes.

Q That is the amount of gas that leaves that compressor station?

A That is correct.

Q And how much gas is required for your operation? Is it the figure of 228.6 that I see on page 37?

A What page is that?

Q I am looking at page 37, Mr. Poor. If you will look at page 37 you will find down in the lower right-hand corner the figure of 228.6?

A Yes.

Q That is the total maximum day requirements of the system?

A That is correct.

Q So that you have got 237.8 coming out of the Pouce Coupe compressor station?

A Yes.

Q And you require 228.6?

A Yes.

Q Now, I observe that Pouce Coupe has a fuel requirement of 2.0, but there will be fuel requirements at other compressor points, will there not?

A Oh, certainly.

Q I am just wondering whether there is enough gas coming out of the Pouce Coupe compressor station, taking the figure of 237.8, to supply your total requirements of 228.6?

A Mr.Nolan, if you will refer to the next preceding flow

diagram, you will see there is set forth the maximum day fuel requirements.

Q Yes?

A For each of the transmission line's compressor stations.

Q That we have on this document?

A That you have on there, plus the gathering compressor stations.

Q Yes?

A I think you will find there is a substantial balance there.

Q I hate to add all those decimals together.

A I will be glad to submit to an audit.

MR.C. E. SMITH: It is time we had a slide rule out, we haven't had one out and we have been here for nearly an hour and a half.

Q MR.NOLAN: It is something under the figure of 10, isn't it?

A Yes, sir.

Q I was just wondering if there is not a substantial surplus there. Going back to your gathering system flow diagram, do I take that 2.0 away from 237.8, do I subtract that?

A No.

Q The 237.8 is what actually comes out after the fuel requirements?

A That is on the discharge side of the compressor.

Q Well, it is a pretty near thing, the 228.6 plus the fuel requirements and your figure of 237.8?

A I do not understand what you mean.

Q Well, do not I have to take away from the 237.8 figure the fuel requirements which are shown on the total system?

A Yes, you do.

Q And if I take them away, how much have I got left?

A Well, I will figure that for you, Mr. Nolan.

Q Thank you, because I cannot.

MR. C. E. SMITH: Something more than 228.6, is that the idea?

A That seems to be, according to my figures, as 7.7 Mcf fuel requirements in the main line after leaving the field's compressor station with a pumpage of 237.8, leaving a balance of 230.1 against the system requirements of 228.6.

Q Yes, what about line losses, Mr.Poor?

A Your line losses will be in that balance of approximately 2 million per day, or 1%.

Q So that from the 230.1 we will have to subtract another 2.0, would we not?

A That is right.

Q That would leave 228.1, and that is not quite enough to supply 228.6. I think I have made my point in spite of myself.

MR. C. E. SMITH: O.K., continue with the dice since you have made your point.

MR. McDONALD: It looks, Mr. Chairman, as if the line loss is taken as 1½% instead of 2. I think that solves it.

THE CHAIRMAN: Any further questions?

MR. McDONALD: I was going to suggest, Mr.Chairman, that Mr. Brown is here now, and we could proceed with him, with the reserve evidence he has available. The reason I ask that he intervene is that he has been here on at least three occasions, and has come here again at this time, and I would like to accommodate him, if possible.

THE CHAIRMAN: I think we might have a short adjournment now, and then take him.

MR.McDONALD: Thank you.

.....

(Hearing resumed after a short adjournment)

MR. McDONALD: Mr.Chairman, Mr. Brown appears on behalf of the Hudson's Bay Oil & Gas Company, and on his own behalf, and I think that I should mention to the Board that Exhibit 42 filed on the last day prior to adjournment, was a submission by the Hudson's Bay Oil & Gas Company. There are a few more copies of that submission available.

.....

R. C. BROWN, having been first duly sworn, testified as follows:-

Mr.Chairman, do you want me to proceed since there is nobody to conduct the examination?

THE CHAIRMAN: Yes.

MR.BROWN: I would like to make it clear to the Board and the Gentlemen at this Hearing, that the Hudson's Bay Oil & Gas Company Limited is making this submission solely in the capacity of a producing and an operating company, and it is entirely without prejudice to any of the applicants for export permits. We reached the conclusion that our experience in this Province during the past year particularly, would justify our making a general statement or a general submission. The submission is made on the basis of our business judgment as an operating company, and not necessarily a technical submission. It is made on the basis that we, as an operating company, used in determing our policies for exploration and develop-

ment. Some of the reserve figures I will mention later may be subject to question, as I think it has been demonstrated that from the same set of facts technicians may arrive at different answers. We simply want to make it clear that these are our own honest estimates, and on which we base our business judgment. The submission which was submitted previously is dated September 4th, 1951, and was previously turned into the Board and a number of the applicant companies, and I presume that you would like me to read that submission, which is quite short.

Q THE CHAIRMAN: Yes.

A The letter is addressed to the Chairman and Members Petroleum and Natural Gas Conservation Board, Government of the Province of Alberta.

Gentlemen:

In making the first submission by Hudson's Bay Oil and Gas Company Limited to any of the hearings of this Board on the question of Natural Gas Reserves in this Province, the Company desires to state its reasons for doing so and the general basis of this submission:-

1. Hudson's Bay Oil and Gas Company Limited is exploring and operating on a substantial basis in the Northwest, Central, and Southern regions of this Province. The Company is definitely interested in developing, producing, and marketing any natural gas reserves it now or may later control, and from such area or areas as may be reached by any system of gas gathering lines. For this reason, this submission is made without prejudice to the position of any one of the several applicants for exporting licences.

R. C. Brown,
Dir. Ex.

2. It is the desire of this Company to assist the Petroleum and Natural Gas Conservation Board by contributing all of our available information so that a determination of the gas export question can be made at the earliest possible date. The prospects or areas mentioned in this report are fairly recent discoveries made on lands controlled by this Company. This report is being restricted to the factual data available in the form of well logs, formation tests, and so forth; and the reasonable estimates of the productive areas we have arrived at after combining that information with our confidential subsurface data.

PEACE RIVER REGION

In the Peace River region, Hudson's Bay Oil and Gas Company Limited and Union Oil Company of California jointly own the acreage shown in yellow on the attached map.

Incidentally, Gentlemen, this supporting data was on the copies of the original submissions given to the applicant companies.

Acreage owned jointly by Hudson's Bay Oil and Gas Company Limited and The British American Oil Company Limited is shown in green. Hudson's Bay Oil and Gas Company Limited is the sole owner of the acreage shown in blue, and in addition owns interests in a number of miscellaneous smaller parcels of land not shown on this plat.

A general regional cross-section is

presented to portray the stratigraphic possibilities for oil and gas accumulation in the Peace River region. The numerous pinch-outs and truncations of formations, as well as structure, afford excellent opportunities for gas accumulation. Furthermore, the attached electric logs and micrologs give supporting evidence of well-developed reservoir beds. Thus far, our exploratory effort has indicated substantial gas reservoirs in beds of Upper Cretaceous Lower Cretaceous, and Triassic age.

Tangent Area:

It is estimated that 22,000 acres of Peace River sand of Upper Cretaceous age and 22,000 acres of Gething sands of Lower Cretaceous age will be productive of gas in the Tangent area. This area is within the proven limits of closure. The Triassic sand production may not prove so extensive as the Peace River and Gething sands.

Gentlemen, I have a supplementary statement dealing with two of these areas which will change some of these conclusions. I would suggest, Mr. Chairman, that it might be helpful in the thinking if I read the supplementary comments with regard to these regions.

Q THE CHAIRMAN: Dealing with the Tangent area?

A Dealing with the Tangent area, I have a number of copies of these, if you would like to have them.

THE CHAIRMAN: Exhibit Number 45.

SUPPLEMENTARY SUBMISSION BY HUDSON'S BAY OIL AND GAS COMPANY LIMITED MARKED EXHIBIT 45.

MR. C. E. SMITH: These are Exhibits 45 and 46?

THE CHAIRMAN: The original was marked by the Board as Exhibit 42, and this is Exhibit 45, the supplementary submission to Exhibit 42.

A. This is a short supplementary report, Gentlemen, which just brings us up to date on some of the developments in these areas. It has reference to the Tangent area and commences similarly to the former submission.

It is estimated that 22,000 acres of Peace River sand of Upper Cretaceous age and 22,000 acres of Gething sands of Lower Cretaceous age, will be productive of gas in the Tangent area. This area is within the proven limits of closure. Later developments now indicate that the Triassic production may be fully as extensive as that of the Peace River and Gething sands. To date Hudson's Bay-Union-North Tangent Wells No.'s 2, 3, 4, and have been completed as gas wells, and the original discovery well No. 1 is being reworked for completion. The attached electric logs, micrologs, drill stem tests and perforation tests give supporting evidence of gas in the zones mentioned.

Well No. 4 was originally perforated opposite the Triassic and initial natural flow was at the rate of 2 ½ million cubic feet. However, after an experimental acid treatment, this well produced gas in excess of a measured rate of 11 million cubic feet per day. Well No. 5 has not been perforated but the Triassic in this well should be a still more prolific producer because of added thickness of the pay section.

Going back to the original submission

now. This supplementary submission just brings us up to date on the development in Tangent area.

Dunvegan Area:

In Hudson's Bay Union-Texaco Well No. 1 in the Dunvegan area, the Peace River and Gething sands have been found to contain large volumes of gas. It is estimated that 10,000 acres of each sand lie within the productive limits of closure. The attached electric log, microlog, and drill stem test give adequate support that this well will produce gas in substantial quantities. Furthermore, attempts will be made to produce this well from the Triassic sand. For the remainder of the Dunvegan area, it seems likely that considerable gas will be present in the Peace River sand and possibly in the Gething sand.

In our supplementary report I just handed to you this morning, we have some additional information for the Dunvegan area. In Hudson's Bay-Union-Texaco No. 1 well in the Dunvegan area, the Peace River and Gething sands have been found to contain large volumes of gas and some gas was shown in the Triassic formation. This well has beem completed with perforations opposite the Basal Gething, and on natural flow built up to a productive rate of 66 million cubic feet per day. It is estimated that at least 10,000 acres of each sand lie within the productive limits of closure.

(Go to page 1504)

THE WITNESS: Returning to the original report, the Cessford area.

THE CHAIRMAN: Valleyview first, I think.

THE WITNESS: Excuse me.

At Valleyview, Pacific Petroleums have discovered gas in the Peace River sand on acreage controlled by Hudson's Bay Oil and Gas Company Limited and Union Oil Company of California. It is indicated by seismic data that a sizeable area is involved. We do not supplement that report because no additional drilling has been done in Valleyview.

CENTRAL PLAINS REGION

In this general region, the major blocks of acreage controlled by this Company are shown on the attached plats. Cessford and Sparky areas are combined on one plat and separate plats are furnished for the Winnifred and Olds areas.

Gas reservoir beds range in age from Upper Devonian D-3 to Upper Cretaceous and are best shown on the attached electric logs and micrologs.

Cessford Area:

In the Cessford area, it is estimated that 135,000 acres will be productive of gas from the Upper Blairmore sand and 65,000 acres from the Basal Blairmore sand. These estimates are based on subsurface contours and isopachs drawn from well control. The Viking sand production has not proven too extensive, although several of the Cessford wells have had gas shows with water and will possibly have a thicker gas column up structure.

R. C. Brown.

To date, Amerada Petroleum Corporation has completed two Viking gas wells in the general area. In Cessford No. 5, a stray commercial gas bearing sand above the Basal sand is present but this sand has not been found in any of the other wells. Consequently, the extent of this sand is unknown. In Cessford No. 3, a promising looking sand is present directly below the Upper Blairmore sand. This sand has not been found in any of the other wells. With a more extensive well program, it is quite evident that a large amount of gas will be found in sands other than the Upper and Basal Blairmore sands. The attached electric logs, micrologs, drill stem tests, and perforation tests give supporting evidence of gas in the zones mentioned. Five Cessford wells have been completed as commercial gas wells. Cessford No. 5, which is now making a small amount of oil, could definitely be produced as a commercial gas well from two different zones. Cessford No. 1 is perforated in the Basal Blairmore sand. Cessford wells Nos. 2, 3 and 6 have perforations opposite the Upper Blairmore sand. Cessford No. 7 will be completed as a dual producer and now has perforations opposite the Basal and Upper Blairmore sands. Canadian Delhi Cessford No. 9 is presently drilling and has found substantial gas in the Upper Blairmore and Basal Blairmore sands. Hudson's Bay-Canadian Delhi No. 8 is now preparing location.

The supplement for that is quite brief where it states:

<u>Cessford Area</u>:

Supplementing original information regarding the Cessford area, we now have eight wells either completed

or capable of being completed as producing gas wells.

Sparky Area:

It is estimated that 22,800 acres will be productive of gas from the Viking sand in the Sparky area. This estimate is based on subsurface contours and isopachs determined from well control and seismic data. The estimate does not cover the area in which Sun Oil Company et al found commercial quantities of gas in the Viking sand at Sibbald. In the Sparky area, two commercial gas wells have been completed in the Viking sand by Hudson's Bay Oil and Gas Company Limited.

The supplementary statement on the Sparky area:

Sparky Area:

Our latest developments may indicate the necessity to reduce the original estimate of productive acreage, and for this purpose we are revising the productive acreage estimate to approximately 15,000 acres.

Hot off the press - a dry hole in the south end of the block yesterday morning.

Winnifred Area:

At Winnifred, small shows of gas were found in several sands in the Hudson's Bay-Winnifred Wells Nos. 1 and 2. In the No. 2 well, the Basal sand had indications of a commercial amount of gas, which was possibly mudded off during attempts to make a completion as an oil well. Seismograph work shows it is quite possible that the Bow Island sand and the Basal sand may be productive over a large area. The Bow Island sands which are productive at the Bow Island gas field, approximately eight miles to

the west, should be good gas reservoir beds at Winnifred as indicated by the electric logs.

No supplement to that area.

Olds Area:

In the Olds area, a large volume of high pressure gas was discovered at the Bailey-Olds No. 1 Well in the Devonian D-3. The extremities or limits of this area can only be determined by further drilling, but our confidential seismic information indicates a large productive area. The Devonian D-2 in this well did not prove productive from a drill stem test. However, it is not certain that the test was a positive one. It is quite probable that the D-2 has excellent possibilities over much of the Olds area. Bailey-Olds No. 1 is perforated in the Devonian D-3 and has demonstrated that it is a gas distillate well of major proportions.

I have nothing to add to that except starting a second well a mile and a half step-out from No. 1.

GENERAL COMMENTS

To date, the search for and discovery of gas has been incidental to the search for oil in the Province of Alberta. In some instances, gas sands may have been mudded off before being protected by casing. In the Peace River, Olds, Cessford, Winnifred and Sparky areas, the original wells were drilled in search of oil with the gas discoveries being incidental. However, more emphasis has been given to the search for gas in the follow-up wells. To date, each well has been drilled to penetrate

the entire section having gas possibilities, and any one well might be expected to produce gas at a much greater rate if drilling had been stopped after reaching a definite pre-determined sand.

In addition to the specific areas mentioned in this report, this Company owns substantial acreage in other known producing gas areas within this Province.

If an adequate market for gas is made available, Hudson's Bay Oil and Gas Company Limited will definitely undertake a more extensive exploratory program in the search for additional gas reserves.

THE CHAIRMAN: Does anyone wish to question Mr. Brown?

MR. C.E. SMITH: If other counsel do not, I have one question to ask Mr. Brown.

THE CHAIRMAN: Any questions, Mr. McDonald?

MR. McDONALD: I haven't, just at this moment, sir.

Q MR. C.E. SMITH: Mr. Brown, I will hit the nail on the head right away. Has your company any contract, agreement, oral arrangements or anything else with any applicant? You have emphasized that you are neutral, so to speak. If you do not want to answer --

A THE WITNESS: No, sir, I am not going to answer that question. We have no contract, commitments or otherwise with any of the applicants. In fact, I have prepared a letter.

Q You would think I knew that, but I did not.

A Which I will give copies of to any applicant and any applicant may submit that letter to this Board, and I specifi-

cally authorize them to do so. I reiterate that our objective in those fields is to find, produce and find gas as well as oil.

Q All I was a little concerned about, some of the applicants at least seem to be a little lacking in Section 3 of the Act, so to speak. You know what I mean. I was hoping you could help any of them or all of them.

A In what way do you mean?

Q By way of any option agreement if, as and when the Board does this, that and so on. We saw some from Northwest originally.

A I will repeat, I have a letter here and I will give it to any applicant, for the right to export gas from the Province of Alberta.

Q I think you had better give that to the applicants. I do not want to be put in the position of assisting them too much. Presently the Hudson's Bay, whatever the official name of your company is, is in the position to deal with anybody but has not dealt with anybody?

A That is entirely correct, sir.

Q With regard to your supplements, has the question of application to this Board assisted your company in your drilling program? In other words, I will put it this way, having regard to the Act and the application, has your company drilled for gas only on occasions rather than oil, and secondly, for gas?

A I think the way I am going to answer your question is that we have not started exploratory wells searching for gas only. We have followed up some of our gas discoveries

with development programs in our prospective areas as a result of the possibility of selling some.

Q Having found indications of gas, you have done gas work, is that right?

A Yes.

Q I suppose you know other companies do the same thing or have done the same thing?

A That is a matter for them to say.

MR. McDONALD: Sir, if Mr. Brown has a letter which he has prepared for general distribution, to give to any applicant, I wonder if it could be read into the record?

MR. C.E. SMITH: I assure the Board I had not the faintest idea he had any letter.

THE CHAIRMAN: I think we will deal with that when we deal with the matter of contracts.

MR. McDONALD: Separately?

THE CHAIRMAN: Yes. At that time he can stress the letter.

MR. McDONALD: The only thought I had with regard to Mr. Brown was whether he had given any thought to estimating reserves in the areas which he has referred to

A THE WITNESS: Mr. Chairman, I stated in this brief submission that has been read that the factual data in the way of well logs, cores and drill stem tests, have been included in the report. That same information has been available to all of the applicants. I think it is perfectly fair that I should state I refer to our own calculations, having arrived at them from that factual data,

plus our confidential core drill and seismic information, and I have expressed to the Chairman of this Conservation Board the willingness, and he has taken advantage of that offer, to permit the engineers of his Board to examine this confidential data in our office. We do have some estimates of our own reserves. It is quite natural, we have to have them in our planning. I would like to reiterate that those figures are our business figures on which we are justifying the development of these gas areas. The figures I will quote here are our estimates of the total gas reserves under the lands we operate, not necessarily our company's net interest. And I would like further to state that they are arrived at in the same way we do our oil reserves or any other type of reserves, that is, on the strictly conservative side.

Q Those reserves are gas in place?

A Those are reserves of producible gas, recoverable gas.

ESTIMATE OF PRODUCIBLE GAS RESERVES UNDER LANDS OPERATED BY HUDSON'S BAY OIL AND GAS COMPANY LIMITED AS AT OCTOBER 25, 1951, PUT IN AND MARKED EXHIBIT 46.

A This statement of reserves is an estimate of producible gas reserves under lands operated by Hudson's Bay Oil and Gas Company Limited, as at October 25th, 1951. It is our best estimate of what there is in the Cessford area, 500 to 600 billion cubic feet. That is not the entire Cessford productive area, that is the lands under the control of our company. Sparky-Oyen area, with the same limitation, land operated or controlled by our company, 50 to 60 billion cubic feet. Olds area, it was my first intention to leave out any estimate at all. Having some

figures by sections and taking an extremely conservative viewpoint, 60 to 70 billion cubic feet. In our North Tangent area, a figure of 400 to 600 billion cubic feet. Dunvegan area, a figure of 100 to 150 billion cubic feet. Those totals show 1,110 to 1,380 billion cubic feet as the range of our estimates, and we have not included any statement or estimate for minor reserves that might be in any other, or, at least, where they are not developed yet. There are no estimates made for Valleyview, Provost, Kinsella and Pakowki Lake where we own substantial interests. That is all I have to say to you, gentlemen.

THE CHAIRMAN: Does anyone wish to question Mr. Brown with regard to Exhibit 46?

Q MR. C.E. SMITH: Is there any reference to what you have put in previously, Mr. Brown? Show us what the Cessford area means, the Oyen area, with regard to geography.

A Yes, the plat, the map attached to the original exhibit, of Cessford, owned and controlled by Hudson's Bay Oil and Gas Company Limited, who are the operating company. We think the Cessford area extends over our lands, the productive area.

THE CHAIRMAN: Thanks, Mr. Brown.

MR. McDONALD: I have Dr. Link. I have tried to get him on the stand for the last month.

MR. NOLAN: Did you give a number to the estimate of reserves which Mr. Brown has spoken of?

THE CHAIRMAN: Yes, No. 46.

THEODORE A. LINK, having been first duly sworn, examined by Mr. McDonald, testified as follows:

Q Dr. Link has been qualified before the Board. Dr. Link has prepared an exhibit entitled "The Possible Natural Gas Reserves in the Peace River and Northeast British Columbia area", which has been distributed.

SUBMISSION OF DR. LINK ENTITLED "POSSIBLE NATURAL GAS RESERVES IN THE PEACE RIVER AND NORTHEAST BRITISH COLUMBIA AREA" PUT IN AND MARKED EXHIBIT 47.

Q Dr. Link, will you deal with your exhibit?

A I do not think it will be necessary to read it, I will just summarize it. It is so small that is probably why Mr. Smith lost it in his exhibits.

MR. SMITH: I haven't seen it before, I will admit quite candidly, even if it was delivered.

A It is a 7-page report.

Q MR. McDONALD: In view of the fact Mr. Smith has not read it, I think you should read the exhibit.

THE CHAIRMAN: Yes.

A Well, I could summarize it in two sentences.

MR. C.E. SMITH: No, you couldn't.

A Mr. Chairman, Members of the Board:

Slightly more than two years ago, when the first hearings with respect to the export of gas from Alberta were initiated, it was suggested that if the then tempo of exploration for oil in the Province of Alberta were to be continued, the discoveries of natural gas reserves would keep pace with those of crude oil discoveries, and in five years from that date this Province could point to

a minimum of ten trillion cubic feet of definitely proven natural gas reserves. This supposedly optimistic prediction was based upon the record of gas and oil discoveries in those parts of the United States where the sedimentary column was comparable with that of the Province of Alberta, and the almost negligible effort made to that date to establish and develop natural gas reserves in Western Canada.

On the basis of the data being submitted to this Board during this present hearing, it appears highly probable that this figure of ten trillion cubic feet will be realized by or before the year 1954. If the more optimistic data are accepted the ten trillion cubic feet figure will be realized before that date.

Since the search for oil and gas has spread out from Alberta into the Provinces of British Columbia, Saskatchewan and Manitoba, and in view of recent discoveries made in some of those provinces, as well as in the States bordering some of these provinces, it seems reasonable to expect the discovery of considerably more than ten trillion cubic feet of natural gas for the Western Province within a very reasonable time.

As pointed out during the first hearing, the discoveries are closely related to the amount of effort put forth by the industry in exploring for both crude oil and natural gas. Because of the greater number of large discoveries of crude oil in what is known as the Edmonton area, by far the largest percentage of exploration effort has been expended in that vicinity and, as pointed out by

those submitting the figures for the proven natural gas discoveries, a considerable amount of natural gas reserves have been found in this Edmonton area since January 1949. Nevertheless, natural gas discoveries of considerable size have also been made in parts of Alberta lying outside of the Edmonton area, and at the present time it appears that ultimately the largest gas reserves in the Province of Alberta will not be established within the Edmonton area but in other parts where the sedimentary section is of greater thickness and thus offers more possible gas horizons than in the Edmonton area. One of these areas is what is known as the Peace River region in western and north-western Alberta and north-eastern British Columbia. The object of this discussion is to point out the reasons for this conclusion.

POTENTIAL GAS AND OIL HORIZONS IN THE EDMONTON AREA.

Drilling to date has revealed that there are five or six potential gas horizons in the Edmonton area as follows:

(a) the Viking gas sand in the lower part of the Upper Cretaceous;

(b) various sands within the Lower Cretaceous;

(c, d & e) Upper Devonian limestones and dolomites such as the D-1, D-2 and D-3 horizons.

In some limited portions of the Edmonton area the Madison limestone of the Mississippian age is also a potential gas horizon. The total sedimentary column in the Edmonton area is a matter of four to nine thousand feet, which includes all Paleozoic sediments below the Upper Devonian.

However, not many tests are carried beyond the known oil and gas horizons of the Upper Devonian. This applies to the Edmonton area and elsewhere.

POTENTIAL GAS HORIZONS IN THE
PEACE RIVER-BRITISH COLUMBIA AREA.

As one travls westwardly from Edmonton into the Peace River area more potential gas horizons are encountered in the geologic column, due to the progressive bevelling of lower formations from west to east at the unconformity below the Lower Cretaceous. In addition to that, many of these gas horizons are in sands of greater thickness than in the Edmonton area, and the potential gas sands are also found at greater depths. Figure I depicts a generalized geological column for the Edmonton area, and another one for the Peace River-British Columbia area, indicating the greater number of potential gas horizons in the latter area, as well as the greater total thickness of sedimentary rocks in that region as compared to the Edmonton district.

The following are the potential natural gas horizons in the Peace River area as already demonstrated by drilling.

The Cadotte Sand, equivalent of the Viking sandstone of Upper Cretaceous age; the Notikewan and Monias sands of Lower Cretaceous age; the Gething or Nikanassin sands of Jurassic and Lower Cretaceous age; the sandstones of Triassic age; the sandstones and carbonates of Pennsylvanian or Permian age; the Madison limestone of Mississippian age; the three possible limestones or dolomites of the Upper Devonian (D-1, D-2 & D-3).

T. A. Link,
Dir. Ex. by Mr. McDonald.

Thus there have already been established nine possible gas bearing horizons in the Peace River area as compared to five or six in the Edmonton district.

On the basis of these data alone it is logical to conclude that eventually larger and more numerous gas reserves should be discovered in the Peace River-British Columbia area than in the Edmonton area. However, this can not come about unless a comparable number of holes have been drilled in the Peace River area through all the possible oil and gas horizons found within the sedimentary column of that area.

PROVEN, PROBABLE & POSSIBLE GAS RESERVES

As this Board has learned from the various presentations made, a sizeable amount of definitely proven and possible gas reserves have already been established in the Peace River area, and this by the drilling of a relative few number of deep test holes. According to the figures submitted by Dr. Nauss, the gas reserves of the Peace River area are 1,027 billion cubic feet. To make these discoveries some 42 deep tests have been drilled in that area, and if the present rate of discovery were to continue in that area it seems reasonable that from one to two trillion cubic feet could be discovered by the drilling of four times that number of holes. It is difficult to delineate the exact boundary lines of the Edmonton oil and gas area, and consequently it is not possible to compare the gas reserves established in that area during the last few years with those of the Peace River area, but calculations, on the basis of an arbitrary boundary of the Edmonton area

as shown on the map before page 6 of Dr. Nauss's report, show that the number of cubic feet of gas discovered in the Edmonton area on the basis of exploratory holes drilled since January 1st, 1949, is not as good a record as has been established in the Peace River area.

In referring to the natural gas reserves discovered in the Edmonton area since January 1949, the reserves established previous to that time in the Viking-Kinsella field are included. The number of exploratory holes drilled in the Edmonton area since January 1st, 1949, is roughly 300. The gas reserves of that area as of January 1st, 1949, including the Viking-Kinsella and Provost Field, were 1,913 billion cubic feet, while today these reserves are calculated to be 2,892 billion cubic feet. This is an increase of 979 billion cubic feet, or roughly 3 billion cubic feet per wildcat well drilled since January, 1949. As already pointed out, 928 billion cubic feet have been discovered in the Peace River area since January, 1949, which amounts to 23 billion cubic feet per wildcat well drilled. These figures do suggest a better finding rate per well than in the Edmonton area. Excluding the Foothills Belt of Alberta, the amount of gas reserves established per wildcat well drilled to date in other parts of Alberta as compared with the Peace River area is not as favourable.

SUMMARY & CONCLUSIONS

On the basis of the thickness of the sedimentary column in the Peace River-N.E. British Columbia area, as compared to other parts of Alberta exclusive of the Foot-

hills Belt, the total ultimate natural gas reserves to be discovered per acre in the former area should be greater than in other parts of Alberta.

On the basis of the number of holes drilled and the exploratory effort put into that area, as compared with other areas exclusive of the Foothills Belt, a better rate of discovery of proven gas reserves has already been made.

Therefore, the Peace River-N.E. British Columbia area should ultimately develop into an area of very large natural gas reserves, and in view of the fact that this area has little promise of intensive industrial development, there need be little concern with respect to dedicating any sizeable reserves for such purposes.

The undersigned believes that if a permit were given to export gas from this area, an intensive development programme would be carried out by the industry.

Q MR. McDONALD: Have you any other data that you wish to refer to in support of your submission?

A Very fortunately this diagram here helps out, some of the points brought out in my submission. I believe this was submitted by the Hudson's Bay Company.

Q It is the Union Oil Company of California, which is the identical diagram as contained in the Hudson's Bay submission.

A This covers a limited area in Peace River itself, but shows how the formations are thickening to the west. That goes on all the way from Edmonton towards Peace River, and also shows the various gas horizons, this well 3, this

one there are 6, and this one there are 2, over here there are 2. Now, the details of that. This diagram was not built with that in view but it does show the point I am bringing out. And I also would like to call your attention to a publication by Mr. Jack Webb of the Anglo-Canadian Oil Company which will appear in the next bulletin of the American Association of Petroleum Geologists, it has already appeared in "Oil and Gas Industries". It is a magazine published here in Canada. In that you will see what are called isopach maps, that is, maps showing the thicknesses of those various formations, and it is quite clear from this that a great number of those sediments which are entirely lacking in the Edmonton area are present in the Peace River area. You can see that for yourself but you can just take, for example, the permo-carboniferous. In the Edmonton area there are no permo-carboniferous, in Peace River they range from 0 to 1500 feet, so that is something added to the column. The same with the Triassic, there are no Triassic in the Edmonton area but in the Peace River it is 0 up to 2500 feet.

Q MR. C.E. SMITH: Is this your evidence or Mr. Webb's?

A This is from published information to substantiate my very generalized statement in this submission that I just gave.

Q MR. McDONALD: Could we put it this way, Dr. Link, that you are familiar with the preparation of this report?

A Yes.

Q You examined the original maps?

A Yes.

Q And you adopt that evidence as yours?

A Yes, up to the time this report was written.

Q MR. C.E. SMITH: It is like fourth hearsay to me.

A Up to the time this report was written it is the best information available to industry. Some of those lines will have to be changed today because everything changes from day to day with more information.

(Go to page 1522)

Q Yes?

A I do not necessarily wish to submit it as evidence, but it more or less substantiates what I said, that is all.

MR. C. E. SMITH: It does not make much of a record when we read it unless somebody submits it somehow.

MR. McDONALD: It can be submitted as an exhibit if the Board would like to have it.

A I think you have it available, everybody has.

MR. McDONALD: The Board has also taken the qualifications of Dr. Webb, Jack Webb.

CROSS-EXAMINATION BY MR. NOLAN:

Q I would just like to ask you, Dr. Link, why do you in your summary and conclusions on page 6 exclude the Foothills Belt in each instance?

A Well, now, the Foothills Belt, the sedimentary column is thicker than east thereof, whether you are in Southern Alberta or Northern Alberta. Everything thickens to the west. Also, the rocks in the Foothills Belt are faulted and duplicated, so that there have been companies that drilled the same horizon one, two or three times, so that you have three chances to get gas or oil from a horizon that is duplicated.

Q I follow that, but why did you leave it out when you came to the question of summary and conclusions?

A Why I left it out?

Q Yes?

MR. C. E. SMITH: It sounds as if he should have put it in, if I understand you two.

A Well, I say here,

"On the basis of the thickness of the sedimentary column in the Peace River - North East British Columbia area, as compared to other parts of Alberta, exclusive of the Foothills belt, the total ultimate natural gas reserves to be discovered per acre in the former area should be greater than in other parts of Alberta. On the basis of the number of holes drilled and the exploratory effort put into that area, as compared with other areas exclusive of the Foothills belt, a better rate of discovery of proven gas reserves has already been made."

Now, what do you want?

Q Why did you leave the Foothills Belt out?

A Because I believe eventually in the Foothills we will find very large gas fields.

Q Yes?

A. But they are going to cost a lot of money to find.

Q Tell me, what is in the Foothills belt, Jumping Pound?

A Yes.

Q Pincher Creek?

A Pincher Creek, Jumping Pound, Turner Valley.

Q What about Bailey-Olds?

A Bailey-Olds is not in the Foothills.

Q Bailey-Olds is not in the Foothills Belt?

A Oh, no.

Q Then I was going to ask you, if I might, Dr. Link, on page 2, you say:

"At the present time it appears that ultimately the largest gas reserves in the Province of

"Alberta, will not be established within the Edmonton area, but in other parts where the sedimentary section is of greater thickness, and thus offers more possible gas horizons than in the Edmonton area."

What did you have in mind, Dr. Link? What were the other parts?

A Parts like the Peace River District.

Q Well, what are they?

A Well, you could take these maps I was referring to, of which nearly all the oil companies have their own studies . . . .

Q Yes?

A . . . showing how thick the sediments are, and, naturally, the whole thesis of my presentation is that the thicker the sediments the more chance you have to find oil and gas. In the Edmonton area we have so much, and west of there the sedimentary column gets thicker and naturally I would say there is more, and north east of Edmonton I would say the least, because you have less of a column to deal with.

Q What about Central Alberta and South Eastern Alberta?

A I would say it is comparable to Edmonton there, but, at the present time -- well, I will tell you, I think I know what you are driving at, because Dr. Brokaw probably prepared those questions. At the last hearing the question was asked, why was there more gas found in the Edmonton area, and I said because more drilling had been going on there. Well, then, Dr. Brokaw asked, "Don't you think the same of Southern Alberta?" and I said, "Yes." And it has been demonstrated to be true. Different companies have come into Southern Alberta and are actually drilling for gas because they hope there will be a market, and

because of that there will be probably just as much gas found in Southern Alberta per square mile as in the Edmonton area.

Q Yes?

A But that applies to the Eastern part of Southern Alberta. As you go West towards the Foothills your chances get larger and bigger because of thicker sediments.

Q I follow you.

MR. C. E. SMITH: You are good if you do.

MR. NOLAN: Well, I have. You may be surprised.

Q This submission, Dr. Link, is for the purpose of contrasting, as I understand it, the possibilities of the Edmonton area as opposed to the Peace River area?

A Yes. I could have compared that with any other spot of the same size in Southern Alberta.

Q But you have not done that?

A No.

Q It is just the two areas?

A And, mind you, only the discoveries since 1949, you see.

Q I see. There was one other thing that you mentioned here, Dr. Link, that interested me. At the bottom of page 1 you say,

> "Since the search for oil and gas has spread out from Alberta into the Provinces of British Columbia, Saskatchewan and Manitoba, in view of recent discoveries made in some of those Provinces, as well as in the States bordering some of these Provinces, it seems reasonable to expect the discovery of considerably more than 10 trillion cubic feet of

"natural gas for the Western Provinces within a reasonable time."

Now, Dr. Link, we have heard a good deal about the exploratory work that has been done in the Peace River area?

A Yes, sir.

Q But I do not think there is anything on record as to the exploratory work that has been done in Saskatchewan. Could you give me some general picture of what is going on in that Province and what success has been obtained?

A I am afraid I cannot give you statistics on that.

Q No?

A But I will say this, that the amount of exploratory work that has been done in Saskatchewan and South Western Manitoba does not compare with what has been done in Alberta. In fact, it is not even as large as was done in Alberta before Leduc was discovered. And I will make this statement, that when a certain number of wells have been drilled, and, as I remember, before Leduc was discovered we had not drilled more than 2000 wells in all of Western Canada, exploratory wells, and then Leduc was discovered, so that I would say, just looking at it from that viewpoint, after some 500 or 600 holes are drilled in Saskatchewan, we might find a Leduc.

Q How many have been drilled, do you know, Dr. Link?

A I haven't got the figures with me.

Q No?

A But it is relatively small. I do not think 200.

Q In Saskatchewan?

A That is right, counting all previous to Leduc and since.

Q And fewer in Manitoba?

A Yes, much fewer there.

Q And then you also made the statement that there have been some recent discoveries in some of the States bordering on our Prairie Provinces, Montana and North Dakota. What has happened in Montana?

A In Montana the Shell Oil found very good gas and light oil in the Madison Limestone, as I understand it, and in North Dakota the Amarada discovery of gas and light oils in the Devonian. Now, I have not details on that. There is at the present time a big land demand and development programme going on in both of those States because of these recent discoveries, which were, of course, sparked by the Leduc Discovery in the first place.

Q Have you made any study as a geologist, Dr. Link, of this area in North Dakota and Montana?

A No.

Q Or, I mean, Southern Manitoba?

A No. I worked in the Saskatchewan area while I was with Imperial Oil, and, of course, I am familiar with the results that were obtained before Leduc was discovered, and, in my opinion, the possibilities for oil and gas are just about as good as they were in Alberta.

Q It just requires more holes?

A Yes, that is all you need and you will find it.

Q MR. C. E. SMITH: Did you say "holes" or "hope", Dr. Link?

A Both. And you have to live right besides, otherwise you won't find anything.

THE CHAIRMAN: Does anybody else wish to question Dr. Link?

A There is one other point I would like to make or to bring out. In Mr. Brown's presentation, while listening to it, it is quite evident that in the supplement that he gave to his original that he shows an increase in finding gas in the Peace River area. Now that they have better regulations with regard to gas from the Government, everybody is trying to find out just whether or not they have gas in those holes. If there were no chances of selling that gas that company would not have been able to increase its gas discoveries in that area any more than has been done before the possibility of pipe lines were discussed. In other words, it is quite evident from Mr. Brown's submission here that the industry is now conscious that they have something for sale in the line of gas, at least they hope they have as soon as it is built and gas exported. And you will find the same picture throughout all Alberta from all the other operators

THE CHAIRMAN: Any other questions?

MR. C. E. SMITH: I have just one question, sir.

EXAMINATION BY MR. C. E. SMITH:

Q Dr. Link, will you refer to page 4 of this document that you have read. It is the last paragraph. I hope no constitutional lawyer will stop me, because you and I can chat anyway.

"On the basis of these data alone it is logical to donclude that eventually larger and more numerous gas reserves should be discovered in the Peace River-

"British Columbia area than in the Edmonton area."
Have you any information you can give the Board with respect to drilling in the B.C., the British Columbia area, or what it might have, what conclusions it may have led you to, and I am asking you that in the light of what I have heard somewhere that there might have been a lot of water in some of them, and they did not lead up to expectations that you have expressed here. Can you help us, Dr. Link?

A The number of holes drilled in B.C. up to now is so small that really practically nothing has been done in B.C.

Q Even with regard to this, have you any knowledge with respect to this?

A No, I haven't any detailed knowledge to give you here, excepting that the Pouce Coupe field is straddled by the Inter-Provincial Boundary line, and some of this gas is in B.C.

Q I heard there was a bit of disappointment in the B.C.-Pouce Coupe field, that was all. Is there anything to that?

A Up to date probably the biggest disappointment was drilling of the Foothills Structure, in the Lone Mountain area, which is high cost drilling again and deep holes, and they did not come up with commercial gas and oil well, with a commercial gas and oil well and, naturally, it was bad news, and it is like the one that the B.C. Government itself drilled years ago, but the number of holes that have been drilled in B.C., you can count them on your two hands.

Q If you count the other two, you got a lot of water and they were no good, is that right?

A Probably if you drill 30 more you can get some.

Q But with regard to what has happened up to date?

A If you drill more you can probably get some more.

Q Answer my question, for once. Does it substantially show that?

A I will give you . . .

Q Don't tell me that it sounds something like Dr. Brokaw may have asked me to ask?

A Most people in the oil and gas business regard northeastern B.C. as a very good place to look for oil. The bad feature is the terrain, getting to the discoveries, the terrain getting to it, it costs much more in getting to there.

Q All right, if that is your answer to my question.

A In the opinion of industry and of other people that know, it is a very good place to look for oil.

Q They just had a very bad start, is that right?

A That is right.

Q Thanks, Dr. Link.

MR. McDONALD: I might just direct the attention of Mr. Smith, he is referring to the Sunrise Field, and that is included in Dr. Nauss' report, which has been filed. The number of wells and the results obtained are all included in that report.

A The details of all of these wells is in the Nauss Report. I will also say this, that we counted the number of wells in the Edmonton area, and I may be wrong by 10%. This is not exact. This is really a bit of crystal gazing we are doing.

MR. C. E. SMITH: That is a poor way to end with your evidence. And I bet the papers won't publish that, either.

THE CHAIRMAN: Thank you, Dr. Link.

WILLIAM B. POOR, recalled, already sworn, examined by Mr. McDonald, testified as follows:-

Q Mr. Poor, you were about to deal with the section in Exhibit 44 at page 46, "Estimated Construction Costs". If you will now read page 46?

MR. C. E. SMITH: What is this section headed?

MR. McDONALD: "Estimated Construction Costs".

MR. C. E. SMITH: In the other submission.

MR. McDONALD: In the submission sent out, Mr. Smith, I only sent out construction costs with regard to the United States' lines, and the gathering system. I did not have the main line construction.

MR. C. E. SMITH: Yes.

Q MR. McDONALD: If you will start at page 46 and then deal with the summaries.

A Westcoast Transmission Company Limited

ESTIMATED CONSTRUCTION COSTS

The following tables summarize and give details of estimated transmission system construction costs for the first five years of operation:

(1) "Summary of Estimated Transmission System Construction Cost"
(2) "Details of Estimated Direct Cost of Pipe Lines and Measuring Stations"
(3) "Details of Estimated Direct Cost of Compressor Stations"

The fifth-year estimated construction cost is $93,212,700.

This estimate reflects price levels of December, 1950, with the purchase of all materials in Canada that

can be procured in Canada including all pipe and compressor units.

Pipe installation costs are based on a classification of terrain with unit installation costs for each class of terrain developed by on-the-ground surveys. A substantial item for omissions and contingencies is provided to allow for minor omissions and the possibility of increase prices.

Q DR. GOVIER: Mr. Poor, your statement concerning the "purchase of all materials in Canada" applies only to those for the Canadian portion of the line?

A That is correct. Page 47 is a summary of the estimated transmission system construction costs, the gathering system in Canada, broken down into 22 items covering surveying and mapping, rights of way and damages, costs of pipe f.o.b. mill, freight on pipe, coating materials including freitht, installation of pipe, line valves installed, highway and railroad crossings, river and stream crossings, measuring and regulating stations, miscellaneous property, and omissions and contingencies. Those twelve items are the direct pipe line costs. Item 13 is a total estimated direct cost of pipe lines and measuring stations. Item 14 is compressor stations. Item 15 is the total of estimated direct cost. Item 16 is engineering and supervision, which has been estimated at 3½%, the organization and management at 5% of Item 15. Then there is a sub-total in Item 18, to which interest during construction has been added at 4%. Item 20 sets forth the taxes and duties. Item 21, the Dominion and Provincial Sales Taxes and Import Duties. And

Item 22 the total construction costs. These all being broken down by years for the first five years of operation.

Q MR. McDONALD: Mr. Poor, the excise tax used is 10%?

A I believe that is correct.

Q Not 8% as in the previous instance?

A No, it reflects the current . . .

Q . . . taxes?

A Current taxes.

Q Yes?

A Page 48 is a similar sheet setting forth the estimated transmission costs for the main line system in Canada.

Page 49 is the summary of estimated transmission system construction costs for the main line system in the United States.

Page 50 is a statement of the details of estimated direct cost of pipe lines and measuring stations for the gathering system in Canada, breaking the gathering system down into the component parts of the main line and the branch lines, and setting the costs out in terms of pipe sizes for the various component parts.

Q MR. C. E. SMITH: When you say "in Canada" you mean in Alberta?

A In Alberta.

Q We had better be careful having regard to what the Supreme Court said the other day.

A Page 51 is a like statement of the details of estimated direct cost of pipe lines and measuring stations.

Q MR. McDONALD: If I might interrupt, Mr. Poor.

A Yes.

Q On page 50, Item No. 7, which is the Grande Prairie pipe size 6-5/8, 47 miles, that is the cost of that branch line to Grande Prairie that I referred to in a previous discussion?

A Yes.

Q Go ahead.

Q THE CHAIRMAN: Wasn't that line previously referre to as a 10-inch line?

MR. McDONALD: Yes.

Q If you look, Mr. Poor, at the transmission diagram of the gathering system, no, the gathering system flow diagram, the map says 10-3/4 inch times 1/4 inch line. That obviously is an error, is it not?

A Yes, it is.

Q You wouldn't build a 10-3/4 inch line to transmit 5 million cubic feet?

A No, not for 5 million cubic feet of gas. There is an obvious error there.

Q DR. GOVIER: And that should be corrected to 6-5/8?

A That should be corrected to 6-5/8.

Q MR. McDONALD: 6-5/8?

A Yes.

MR. C. E. SMITH: That is on page 44, is it, Mr. McDonald?

MR. McDONALD: That is the second diagram following page 44, in the centre of the page, just under the town of Webster.

MR. C. E. SMITH: 6-5/8?

MR. McDONALD: The figure 10-3/4 should be 6-5/8.

MR. STEER: Multiplied by?

MR. McDONALD: 1/4 inch.

Q It is 1/4 inch, Mr. Poor?

A Yes.

Q Will you continue, Mr. Poor?

A Page 51 is a detailed estimate of direct costs of pipe lines and measuring systems of the main line in Canada, I am sorry, measuring stations of the main line systems in Canada, as well as the branch lines to Fort McLeod, Prince George, Quesnel, Williams Lake, Savona, Kamloops, Merritt, Princeton, Hope, Chilliwack and Vancouver.

Q Now, you might explain, Mr. Poor, just where the "Y" is. Would you refer back to the map which follows page 34?

A The "Y" is designated here as just north of the International Boundary, it is just north of the International Boundary and the town of Sumas.

Q So the "Y" is the branch line to Vancouver and the continuation of the main line into the United States?

A That is correct.

Q Yes?

A Page 52, on that page there is a similar statement of the details of estimated direct cost of pipe lines and measuring stations of the main line and branch lines into the United States.

Page 53 sets forth the details of the compressor station costs for the gathering system in Alberta for the first 5 years of operations.

Page 54 sets forth the details of the estimated direct cost of compressor stations of the main line in Canada.

Page 55 sets forth the details of the estimated direct cost of compressor stations of the main line in the United States.

Q MR. McDONALD: Now, Mr. Poor, the methods used in arriving at these estimates are those which were detailed by yourself and Mr. Phillips of your staff in evidence before the Board about a year and a half or so ago?

A That is correct. The prices which are used herein, however have been adjusted to the 1950 prices, which were the most current quoted prices that we had, plus the revisions for sales tax or excise taxes.

Q Yes. If you will answer other counsel, please, Mr. Poor?

MR. NOLAN: I was just going to ask Mr. McDonald if Mr. Poor was going to be here tomorrow.

MR. McDONALD: Yes, sir. I was thinking with regard to the situation we find ourselves in. It is going to be necessary for Mr. Poor to prepare or, I mean, to reduce to type, to have it typed and have it printed, that is this question of transmission costs, and for reasons which I explained to the Board about ten or so days ago, we have found ourselves unable to have that ready this morning. It was just turning over in my mind, and I was wondering if it would be possible that we adjourn for the whole of tomorrow and then proceed Wednesday, and then at that time we might have the other exhibits of the other parties available, then we could go right through on Wed-

nesday and Thursday.

MR. C. E. SMITH: That is a nice suggestion, well put, Mr. McDonald, exhibits of the other parties.

THE CHAIRMAN: Have any of the other counsel anything to say with regard to Mr. McDonald's suggestion?

MR. MARTLAND: Satisfactory as far as we are concerned, Mr. ~~Poor.~~ Chairman

MR. NOLAN: No objection, sir.

MR. STEER: I have no objection.

MR. C. E. SMITH: Somebody also has to prepare something else for Dr. Govier.

THE CHAIRMAN: Mr. McDonald, will the information with regard to the line from Pincher Creek, will that be available Wednesday too?

MR. McDONALD: Yes, sir.

THE CHAIRMAN: Well, we will adjourn then until Wednesday, but I would like to impress upon counsel that we do not intend to keep on adjourning this hearing. The Bord has a lot of commitments, and we expect that this evidence will be presented as soon as possible, and submissions must be in to give time for counsel to cross-examine. I hope this is the last time we have to adjourn because of lack of submissions and lack of evidence to be presented.

We will adjourn until 9.30, then, Wednesday morning.

(Hearing adjourned until 9.30 A.M. October 31st, 1951.)

The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

Application for Permission to Remove or cause to be removed Natural Gas from the Province of Alberta, under the Provisions of the Gas Resources Preservation Act by Western Pipe Lines.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session:

Volume_____